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JUAN JOSÉ CASTRO.

TREATISE

ON THE

SOUTH AMERICAN RAILWAYS

AND THE

GREAT INTERNATIONAL LINES

PUBLISHED UNDER THE AUSPICES

OF THE

MINISTRY OF FOMENT

OF THE

ORIENTAL REPUBLIC OF URUGUAY

AND SENT TO THE

WORLD'S EXHIBITION AT CHICAGO.

MONTEVIDEO.

LA NACIÓN STEAM PRINTING OFFICE, CALLE 25 DE MAYO N.os 146 TO 154

1893.

To His Excellency, the Secretary of State for Commerce, Industry, Railways and Public Education, Engineer Juan Alberto Capurro.

Sir,

Two great projects indicate the progress made by the New World during the latter years of the present century, which, assuredly, will not be allowed to close without the inauguration of the gigantic works involved viz: the Intercontinental Railway and the South American Inter-Oceanic Railway. The object of the first named line is to establish direct communication between both Americas, from Canada down to the River Plate and Chile: the second is intended to shorten the time required for communication between the Pacific Ocean, the River Plate, and Brazil, and the European Continent, and at the same time to open up new facilities for commerce between the Republics through whose territory it will run.

On account of its geographical situation and the technical features of its Railways, the Oriental Republic of Uruguay, is destined to occupy a most prominent position in the fulfilment of the two projects above indicated.

Acting on this idea, the patriotism of which demands that it should be published throughout all America, your Excellency has been good enough to entrust me with the

preparation of a treatise to be sent to the World's Exhibition at Chicago, proving the truth of same by comparing the South American Railways and studying the other factors that must be taken into account in the solution of such vast problems.

And your Excellency, these problems ought not to be considered remote questions of yet uncertain future, and therefore devoid of practical intest.

With regard to the Inter-Continental Railway, its success is fully guaranteed by the initiative taken by the powerful and enterprising nation in whose own territory there is an extent of railways nearly equal to that of all the other nations of the world.

Since its approval by the Pan-American Congress in 1889, the United States have not for one single moment allowed the idea to drop, and the practicability of the project has already been proved by the Engineering Committees appointed at the Congres referred to. The surveys now reach the Bolivian heights.

As regards the Inter-Oceanic Railway, the construction of the part of the line traversing the Chilian Republic is almost concluded, as also that in the Argentine territory: the concession is granted and the surveys fully completed of the Section corresponding to the Oriental Republic, and the line to be made from Pernambuco to our San Luis frontier is also partly surveyond. For Brazil that Railway is of vital importance, and the immense means at the disposal of that great nation, and the credit it justly enjoys, are a guarantee as to the realization of the work which at the present moment is only delayed by purely accidental causes.

There is, therefore, really practical utility in the information which your Excelency has ordered me to get

together and which will not be found of interest to our own country exclusively. On the contrary, it is of the greatest interest, not only for South America, but for the whole World, to show, in a concise form, the progress of the Railways in South America, the distribution and features of the lines in each State, and what will be the destiny of those lines when combined with the great International Railways that are projected.

It is to be regretted that only a very short space of time could be allowed for the execution of so important a work, but possibly this may have been made up for by the energy, and good will displayed, and is it with this hope that I have the honor of placing in your Excellency's hands the work which I have just concluded.

The Brazilian Railways, covering, as they do, an immense extent of country, have been the object of special attention. By a decree dated the 15.th January 1890, the Brazilian Government appointed a committee of Engineers charging them with the preparation of a general Railway map and with the delineation the extensions and branches necessary for the service of so large an area, but up to the present the results of their labors have not been made public. I have however consulted every known publication respecting the Brazilian Railways, and I can assure your Excellency that not only are there mentioned in this treatise all those lines which are already being worked or are under construction but also those still under survey or only projected.

With respect to Argentine Railways, I have been able to avail myself of the latest and most complete information concerning them thanks to the courtesy of the Public Works Department and the General Railway Board of that Republic.

It has been still easier to obtain satisfactory data respecting the Peruvian, Bolivian, Chilian and Paraguayan Railways as they are much less complicated.

For the compilation of Statistics and other data referring to the railway question I have made use of the latest official and private comunications.

In compliance, therefore, vith your Excellency's suggestion, this treatise embraces the following subjects:

I. Railways of the Republic of Uruguay.
II. do " " Argentine Republic.
III. do " " United States of Brasil.
IV. do " " Republic of Chile.
V. do " " " " Paraguay.
VI. do " " " " Bolivia.
VII. do " " " " Perú.
VIII. Inter-Continental line.
IX. Inter-Oceanic line.
X. Population of the South American States and the argument justifying the delineation of the inter-continental and inter-oceanic lines.
XI. The ports and railways of the Oriental Republic considered as necessary elements for rapid communication between the Argentine Republic, Chile, Perú. Bolivia, Paraguay and the Brazilian province of Rio Grande del Sud.

This treatise is supplemented by a General Map of the South American Railways, whether working, under construction, or projected, which shows, clearly and graphically, the immense and exceptional importance of the Uruguayan Railways when considered as a means of international communitacion.

The Map has been drawn to a scale of 1 in 4.00.000,

Bonne's projection, taking as meridian that of Montevideo which passes through the North Tower of the Cathedral and as middle parallel the 23rd degree of South latitude. The part of the terrestrial sphere shown is that included between the 6th and 40th degrees of South latitude and the 21st and 24th of longitude East and West respectively from Montevideo.

The principal points of the Atlantic, River Plate, and Pacific coasts have been determined from the geographical quantities given in the Paris "Annuare du Bureau des longitudes" of 1892: and the hydrographical and orographical information has been taken from the best charts of ths various countries which the Map embraces.

I take this opportunity of saluting your Excellency with all consideration.

Juan José Castro.

Ministry of Fomento.

Montevideo, February 16th 1893.

The treatise on South American Railways compiled by don Juan José Castro under the direction of the Ministry of Foment for trasmission to the Chicago Worlds Exhibition is hereby approved and is to be published.

HERRERA Y OBES.
JUAN A. CAPURRO.

CHAPTER I.

RAILWAYS OF THE URUGUAYAN REPUBLIC.

From various causes, viz, its geographical position, its natural ports on the Atlantic Ocean and River Plate, its temperate climate, its fertile soil, its exceptional natural increase of population in respect of which it surpasses countries more favored by nature, the nature of its population, exempt as it is from deteriorating influences such as inferior races, its spirit of activity and labor, proved by the high figure exceeding that of the other States of América represented by each member of the population in the commercial and industrial development of the countries, Uruguay may be classed as one of the first countries on the Continent.

If, on account of its progress, Uruguay is at the present moment one of the most advanced countries of the new world, its importance will in the future be much increased as a necessary element for rapid and cheap communications with the countries situated beyond the vast Plate district.

Fortunately, the outlines of the Uruguayan Railways, as established by the law of the 27 th August 1884, will each, on account of their direction, be of the greatest international importance: the lines which radiate from Montevideo towards the River Uruguay will spread across the

Argentine system in order to reach Bolivia and Perú; by the line to Rivera, the shortest route will be found to Asunción, to the eastern district of Bolivia, and to the Intercontinental line which has been surveyed by engineering committees appointed by the International Railway Conference held at Washington. The lines which go towards Yaguarón and Lake Merim will shorten the time necessary for communication whith Río Grande, Pelotas, and Porto Alegre; lastly, the transverse line from Colonia to San Luís, as a seccion of the inter-oceanic line from Recife to Valparaiso, will communicate on the one side with Argentina and Chili, and on the other with the interior of the States of Río Grande del Sud, Santa Catalina, Paraná, San Paulo, Minas Geraes, Bahía and Pernambuco which will make this line of immense importance to the system to which it belongs.

By a study of the map of the South American Railways which we have prepared it will be easy to understand the importance of all the lines mentioned, which may be considered principal elements of the South American system of railways.

In the midst of its political agitations of the past, Uruguay has achieved a conquest which as time passes, will, without doubt, influence its progress and future grandeur, this conquest is its network of railways, cleverly conceived and to be carried out under the conditions to which all first class railways in America should be subjected.

When the construction of this system is completed, its connection with the lines of the neighbouring States established, and the fruits of this work of foresight and patriotism are being reaped, coming generations will gratefully remember their benefactors, who, with a clear perception of the important part which it would fall to

Uruguay to play in the railway communications of the American Continent, laid down the routes to be followed by the trunk lines of the system with so much prudence and foresight that there is not a single line projected that is not of great international importance, and this will, in the future enable the port of Montevideo, in which thousands of kilometers of railway from the most distant regions converge, to strengthen and increase the superiority which, by its situation and natural advantages, it has always enjoyed over the other ports of the River Plate.

For the purpose of drawing up the general railway law to which we have already referred, the Executive Power of the Nation appointed in the year 1872 a committee of engineers composed of don Antonio Monteiro, don Carlos Honoré, don Juan Alberto Capurro, don Carlos Olascoaga, don Emilio Dupré and don Enrique Penot who were to determine the trunk railway lines which, starting from Montevideo, should cross the country in various directions, and in the future serve as rapid communications between the interior of the country, the capital, and the Brazilian and Argentine frontiers, whilst forming, at the same time, a well combined plan of defence.

On the completion of this work, Senator don Juan Alberto Capurro drew up, in the year 1884, a project of law, incorporating with it the general outline as counselled by the above-mentioned committee, and on August 27th of the same year it was sanctioned by the Honorable Assembly.

According to this law, the lines which constitute the Uruguayan railway system are the following:

Central	Uruguay	Railway.
Northeastern	"	"
Eastern	"	"

Western	Uruguay	Railway
Midland	"	"
Northwestern	"	"
Northern	"	"

The four first, which are the principal trunk lines, start from Montevideo and terminate respectively in Rivera, Artigas, Port Cebollati of Lake Merim, and Fray Bentos the three last form the extensions from Paso de los Toros to Paysandú and Salto, from Salto to Santa Rosa, and from Isla de Cabellos to San Eugenio.

But, however, these lines whose initial point is Montevideo and which separate more and more from each other the further they get from the Capital, were not in accord for the want of means of inter-communication, as for this purpose it was necessary to come to the converging point, unnecessarily running over long distances.

Besides, the general railway outline left a space of 400 kilometers on the Brazilian frontier, between Rivera and Artigas, without any direct communication with the capital.

Understanding the necessity for intercommunication between the trunk lines tnat run out of Montevideo and of a line to a middle point on the frontier between Artigas and Rivera, the Executive Power on September 6th 188 published the law dictated by the Legislative Body which granted the concesión for the Interior of Uruguay Railway: this railway starts from the Port of Colonia, opposite Buenos Aires and La Plata and runs to San Luis on the Brazilian frontier, forming junctions with the Western Central and Northeastern lines: with the first named at El Perdido, with the second at Durazno, and with the third at Cerro Chato (Puntas del Yi). With this line, the general system of railways, of a uniform gauge of 1m.44 between the rails, is complete.

The country does not need any more lines of the importance of those which form its system of internal communication, that is to say, of lines of general interest; what the Republic ought in future to project and carry into execution are lines of local interest to serve the industrial centres and colonies. For such railways we consider that it would be more convenient to adopt a gauge of 60 centimeters.

With respect to the importance to our country of the railway system as established, we will quote an interesting impartial opinion, that of the illustrious Brazilian engineer Doctor Ewbank da Camara, who, in his work entitled "Caminhos de Ferro Estratégicos do Rio Grande do Sud" says as follows:

" In all South America there is up to now only one " country that, convinced of the absolute necessity of a " general plan of internal comunication, has laid down the " complete outline of its Railways.

" I refer to the Oriental Republic of Uruguay, á country which is so distinguished among its neighbours by " the powerful force of will with which it undertakes and " carries on the most important improvements, without " allowing the realization of its projects to be hindered " either by internal struggles or by the hazards of the " wars which it has undergone, and still less by the financial state of the country.

. . . . . .

" The subject of this chapter, the general plan of internal communication, demands the most serious attention " and study, and, speaking frankly, does honor to the " Committee who drew it up.

" The demands of Commerce have been satisfactorily " attended to, while strategic necessities have been pro-

" vided for, that is to say: the means of offence and " defence in the vulnerable points and in those most " exposed to foreing invasions, viz the oceans, the rivers " and the land frontier. "

The following statements will show the length in kilometers of the railways of the Urnguayan system constructed, in construction, surveyed, and being surveyed, as also the capital authorized, the capital invested in the lines, the guaranteed capital the amount of the guarantees, the length that the system will consist of when constructed, and the capital it will represent.

RAILWAYS IN THE ORIENTAL REPUBLIC OF THE URUGUAY.

RAILWAYS.	EXTENSION IN KILOMETERS.				
	Open.	*In construction.*	*Surveyed.*	*Projected.*	TOTAL.
Central Uruguay (Montevideo to Paso de los Toros.	272.880				
Central Uruguay Northern Extension (Paso de los Toros to Rivera)	293.700				
Branches of Central Uruguay:					
(*a*) 25 de Agosto to San José	33.720				
(*b*) Sayago to Treinta y Tres	8.000				
(*c*) Paso de los Toros to Piñeyrúas saladero	1.000				609.300
Montevideo to Minas .	122.615				122.615
North East Uruguay Railways:					
(*a*) Toledo to Nico Pérez	206.200				
(*b*) Nico Pérez to Melo and Artigas . .				305.000	
(*c*) Branch to Treinta y Tres				70.000	581.200
Uruguay Great Eastern Railways:					
(*a*) Olmos to Solís Chico.	30.000				
(*b*) Solís Chico to Maldonado		83.463			
(*c*) Maldonado to Laguna Merim . . .			306.000		419.463
Midland Uruguay, Railway: (Paso de los Toros to Paysandú and Salto)	317.755				317.755
North West Uruguay Railways: (Salto to Santa Rosa. . . .	178.800				178.800
Uruguay Northern Railway: (Isla Cabellos to San Eugenio) . . .	114.200				114.200
Northern Railway: Montevideo to Barra Santa Lucía	23.000				23.000
Uruguay Western Railway; Montevideo to Rosario and Colonia.		223.883			
Rosario to Mercedes and Fray Bentos . . .				194.000	

RAILWAYS.	EXTENSION IN KILOMETERS.				
	Open.	*In construction.*	*Surveyed.*	*Projected.*	TOTAL.
Branch from Perdido to Carmelo and Palmira				115.000	
Branch to Dolores				30.000	562.883
Uruguay Interior Railways: Colonia to San Luis (Brazilian frontier) passing through Perdido, Trinidad and Durazno			580.891		
Branch to Cerro Chato			36.731		617.622
Loop line from Sauce Port to Rosario and San José (Lacaze concession)			86.000		86.000
	1.601.840	307.346 (1)	1.009.622	714.000	3.632.808

APITAL INVESTED IN THE RAILWAYS ON THE 1st JANUARY 1893.

RAILWAYS.	AUTHORIZED CAPITAL. £	AMOUNT OF CAPITAL INVERTED $. (2
Central Uruguay and branches	2.650.000	12.893.416
Central Uruguay Northern extension	1.666.666	7.821.803
North-Eastern Urug. (Toledo to Nico Pérez)	1.666.666	5.635.746
Montevideo to Minas	800.000	3.892.350
Uruguay Great Eastern (Olmos to Maldonado and Lake Merim) (3)		750.000
Midland-Uruguay (Paso de los Toros to Salto)		7.711.722
North-Western Urug. (Salto to Santa Rosa)	1.410.000	6.860.370
Uruguay Northern (Isla Cabellos to San Eugenio)	570.775	2.777.071
orthern (Montevideo to Barra de Santa Lucia)		671.430
		49.013.908

(1) The construction of these lines is entirely suspended.

(2) $ 100 Uruguay gold are equivalent to $ 1652 United States currency.

(3) $ The capital of the Great Eastern, Midland, and Uruguay Northern lines, has been calculated on the kilometric cost per mile as fixed by the laws of concession for the payment of the guarantees.

RAILWAYS OPENED TO TRAFFIC WITH GOVERNMENT GUARANTEE.

RAILWAYS.	Length in kilometers.	Kilometric cost.	Amount of capital guaranteed 1st January 1883.	Interest guaranteed	Total cost of guaranteed service.
		$		%	
Central Uruguay North-ern extension: Paso de los Toros de Rivera.	293.700	24.327	7.144.840	3 1/2	250.070
North-Eastern Urug.: Toledo to Nico Pérez.	206.200	24.327	5.016.227	3 1/2	175.567
Montevideo to Minas .	85.317	24.327	2.148.487	3 1/2	75.197
Midland-Uruguay: Paso de los Toros to Paysandú and Salto.	317.775	24.327	7.631.512	3 1/2	267.103
North-Western Urug.: Salto to Santa Rosa.	80.257	24.327	1.952.412	3 1/2	68.334
Uruguay Northern Isla Cabellos á San Eugenio	114 200	24.327	2.778.143	3 1/2	97 235
	1.100.449		26.671.621		933.506

There were on January 1st 1803, 1334 kilometers 747 meters opened to traffic with a Government guaranfee of 3 1/2 % on a capital of $ 27.505.989.

The total amount of the guarantee service would have been $ 962.709 but in spite of the crisis some of the lines are able to cover their working expenses and also, show a balance of profit that has been credited to the general guarantee account. During the year 1892, the guarantees paid to the various lines were as follows:

TOTAL AMOUNT OF INTEREST PAID TO THE GOVERNMENT GUARANTEED LINES IN 1892 AT THE RATE OF 3 1/2 %.

Central Uruguay Northern Extensión Railway . .	$	239.957.28	
North-Eastern, (Toledo to Nico Pérez)	"	171.846.30	
Montevideo to Minas . . .	"	72.117.20	483.920.78
Midland-Uruguay.			269.940.82
North-Western.			68.334.96
Uruguay Northen.			97.197.74
			919.394.30

TOTAL CAPITAL THAT WILL BE REPRESENTED BY THE RAILWAYS ON THE COMPLETION OF THE LINES SURVEYED AND PROJECTED.

RAILWAYS.	Total length of line.	Kilometric cost as fixed by law.	Interest guaranteed %	Total capital. $	REMARKS.
Central Uruguay Montevideo to Paso de los Toros and branches from 25 de Agosto to San José, Sayago to Treinta y Tres, Paso de los Toros to Piñeirua saladero . . .	315.600			12.893.416	The Central line from Montevideo to Durazno which was the first line laid in the country had a government guarantee of 7 % on the outlay of £ 10.000 per mile on $ 30.239 per kilometer. From Durazno to Paso de los Toros the government only gave a subvention of 500 £ per mile the company undertaking to return same when the dividends exceed 8 %. By an agreement made with the Goverment on 22th February 1878, the Company renounced the guarantee on the section from Montevideo to Durazno.
Central Uruguay Northen extension Paso de los Toros to Rivera . .	293.700	24.327	3 1,2	7.821.803	The guarantee is only on 7.177.840 dollars.
Montevideo to Minas	122.615	24.327	3 1,2	3.892.350	The guarantee is only the total capital.
North Eastern Toledo to Nico Pérez and the prolongation to Melo and Artigas with a branch to Treinta y Tres	581.200	24.327	3 1,2	14.138.852	The guarantee of 3 1,2 % only refers to the section between Montevideo and Nico Perez with a capital of 5.016.227 dollars.

RAILWAYS.	Total length of line.	Kilometric cost as fixed by law.	Interest guaranteed. %	Total capital. $	REMARKS.
Uruguay Great Eastern Olmos to Maldonado and Lake Merín	419.463	24.327	7	10.204.276	The construction of this line is at present suspended.
Midland-Uruguay	317.775	24.327	3 1/2	7.730 512	This line is open to traffic, the total capital being guaranteed.
North-Western .	178.800	24.327	3 1/2	6.860.370	Open to traffic the guarantee only being on 1.952.413 dollars.
Uruguay Northern: Cabellos to S. Eugenio.	114.200	24.327	3 1/2	2 778.143	This line is open to traffic, the total capital being guaranteed.
Western and branches. . .	563.000		6	16.435.456	It was arranged to construct the Western lines for the government at £ 6.000 per mile payable in funded bonds at 85% bearin 6% interest and 1% amortization. The construction is suspended.
UruguayInterior	617.662	24.327	6	15.025.863	The concession guarantees 6 % on a kilometric cost of £ 5.000.
	3524.015			97.781.041	

With the completion of all the principal lines proposed in the Republic, the amount of capital thus invested will total a sum of $ 83.642.89, represented by 3.524 kilometers of railway, or including the short line of 23 kilometers to the Barra of Santa Lucía, open to traffic, and the line projected by Lacaze's concession 86 kilometers without having any guarantee, the grand total length of the lines will be 3.633 kilometers.

We will new briefly recount: the programme to be

observed in the general plan of railway construction as established by the Railway Law of August 27th 1884 and the decree, amplifying it, of Seotember 3rd of the same year, as also the regulations laid down by the said law and decree; the law, amplifying that of 27th August 1884, published on November 30th 1888; the law referring to the Interior of Uruguay Railway; the histerical description of the railways; the agrement celebrated in London with respect to their guarantees:—and we wil examine the technical features of the various lines in the Republic, the cross sections adopted for the road-bed, the buildings and constructions of importance in each line, mentioning the locality in which they are found and the height above sea level, the locomotives and rolling stok that the varions Companies ewn, the general results of their working, and finally, the rules for the inspection of railways guaranteed by the State.

Infrastructura (*)

By the General Railway Law of August 27th 1884 and by the Executive decree regulating same of September 2rd 1884, it is ordered, that in the construction of the earthworks bridges, etc., the following regulation must be observed:

(1) Maximum grade	12	milimeters por meter.
Ditto under exceptional conditions	16	" " "
Einimum radius of curves . .	400	meters.
Ditto ditto under exceptional conditions.	300	"

(*) This term covers all that portion of the construction work of a railway up to the rail laying and thus includes surveys, plans, sections, earthworks, bridges, tunnels, etc. The laying of the rails and all subsequent works come under suprestructura.

(1) General Railway Law of August 27th 1884 – Article 2.

(1) Minimum distance permissible between two curves in opppsite directions 100 meters.

Minimum distance of level between two adjacent grades of more than 004 per meter, 100 meters.

(2) The general plan and section of the line will be decided upon the presentation of the general proposal referring to the whole or any part of the same.

The scale of the general plan shoul be 1 in 1000; and of the longitudinal section 1 in 5000 for distances, or 1 in 1900 for heights; these latter measurements being taken as from sea level. (3).

On the longitudinal section must be shown the kilometric distances of the line measured from the point of starting: the length and conditions of each grade; the length of all sections on the level, the direction and radius of each curve, and the angle formed by the straight sections.

A cross section of the type of line, an account explaining the general ideas of the project, accompanied by a

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(1) Article 3 of the Executive decree of September 3rd 1884.
(2) Article 11 ditto ditto
(3) Standard of reckoning for taking heights above sea level: Public Works Department. To the Minister of Public Works. On the 18th of May I had occasion to point out to Mr. Galwey and three of his staff the standard point adopted for the frequent observations that I have had to make during past years. This point is found on the south side of Montevideo on a large rock more or less 125 meters to the East of the English church. In order that later on there may be no difficulty in recognizing tois spot I gave instructions that an iron should be fixed in it and same has been done, I also, to further ensure no mistake, ordered the bearings of the point to be taken in connection with Cámaras, Treinta y Tres. Camacuá and Brecha streets, which have been duly effected as shown on the attached map and marked in red ink. It should therefore be ordered that in conformity with Article 11 of the Executive decree of September 3rd 1894 the longitudinal levels of the various railways in the Republic must be adjusted to the sea level as adopted on the above mentioned rock morked in the attached plan by the latters P. R. In order to assist the Railway companies a level was taken of the relative height of the extreme Southern threshold of the principal door of the Cabildo and it was found that this point was 23 meters 18 centimeters above

return showing the proposed gradients with difference of levels, also one showing the number of curves with their radius and other details.

The position of the stations or stopping places proposed, the rivers or streams crossed by the line, also the roads, must be marked and named both in the general plan and longitudinal section. In this section must also be shown the position of the culverts, bridges, level crossings, waterways and any other construction designed for drainage purposes or intended to allow the streams to pass unimpeded where crosse by the line.

(1) When it is necessary for the line to pass over a public road the distance between the buttresses of the bridge or viaduct constructed for this purpose must be at least 8 meters.

The smaller bridges built on arches must be at least five meters high measured from the road level to the keystone of the arch, but this height may be reduced to

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the level of the spot marked P. R. or the level of sea. Thus the Railway Companys can take the threshold of the principal entrance to the Cabildo as a second point of reference for purposes of levelling. With the object of conveying this information to you as instructed etc.

Montevideo, June 7th. 1887.

Juan B. Zanetti,
Civil Engineer.

Ministry of Government.

Montevideo, June 16th. 1887.

Having considered the petition of the North Eastern Uruguay Railway Company, and in accordance with the opinion of the Vice-president of the Public Works department, Engineer Juan B Zanetti, the Government hereby resolves: To approve of the point marked on the accompanying map by the letters P. R. as the standard of sea compliance with Article 11 of the Executive decree promulgating the General Railway Law. Let this be noted and published.

TAJES.

Julio Herrera y Obes.

(1) Art. 15 of the Executive decree of September 3rd 1884.

4 1/2 meters when the bridge is built with iron or timber horizontal beams.

The width of the larger bridges at rail level is fixed at eight meters when crossed by a double line of rails or rails or at four meters and a half when only crossed by a single line.

Both sides of the line must be provided with a safe platform to enable employees to cross in safety and the sides of the bridges must be properly protected by hand rails.

(1) When the line has to pass under a public road the distance between the buttresses must be ten meters, allowing of an eight-meter roadway with paths of one on each side.

All buttresses and breast-works must be solid with a minimum height of one meter.

The distance between the abutments must be eight meters for a double line or four and a half meters for a single line of railway.

The height, measured from rail level between the outer rail and the abutment to the lowest cross beam of the bridge, must be at least four and a half meters.

(2) In such points as it may be necessary to cross the public roads by level crossings the rails shall be laid so as not to offer any obstruction whatsoever to the passage of ordinary vehicles.

The line must not cross a public road by a level crossing at an angle with it of less than forty five degrees (45°).

All level crossings in populated districts must be provided with barriers and the Public Works department

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(1) Art. 16 decree of September 3rd 1884.

(2) Art. 17 do. do.

must order the erection of huts for the accommodation of the road-guards in those places where they may be considered necessary for the public safety.

The class of barriers and railings to be employed must be approved by the Public Works Board.

(1) The railway Company must make the water channels considered necessary for draining the line and the dimensions of same will be fixed by the Public Works Board according to the local conditions affecting them on the aplication of the Company.

(2) When, in order to cross a public road, it may be necessary to alter the level of same, the Railway Company is obliged to do all the necessary earthworks and to pave the part modified, furthermore maintaning same in good repair for three years after.

The Public Works Board will decide as to the grades permissible in the modification of any public roads when consulted by the Company.

(3) The Company must at their own expense re-establish the natural flow of any stream whose course may have been interrupted or diverted during construction work.

The bridges and culverts that it may be necessary to construct for carrying the line over rivers, streams, etc., must be at least eight meters broad at rail level when crossed by a double line or four and a half meters broad for a single line.

The height and opening of these works will be resolved by the Public Works Board after due consideration of the special features of each case.

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(1) Paragraphs 1 and 1, Articlo 12 of the reglamentary decree.
(2) Article 18 of the reglamentary decree.
(3) Article 21 do. do.

(1) Should it be necessary to build any tunnels these shall be, measured at rail level, at least eight meters broad and six meters high to the keystone of the arch. The vertical height from the outside rails to arch must be at least four meters and a half.

The ventilation shafts must be built with a rampart two meters high and must not be opened in any public road or street.

(2) When any line has to cross a navigable aiver or canal the Company must at its own expense take the necessary measures to ensure that the navigation is not interrupted by the construction works.

Also when crossing any public road, to avoid interrupting the traffic, if necessary the temporary bridges or roads required until the permanent works are finished, shall be made at the expense of de Railway Company.

Before diverting the traffic from any public road over any such temporary structure, the Public Works Board shall examine the safety of same and shall fix a time for the completion of the permanent works required to resume traffic on the original roads.

Superstructura.

The general conditions, regulating the construction of the railway works other than those dealt with in the preceding chapter, are, by the General Railway Law and decree already mentioned, established as follows.

(1) Article 20 of the Executive decree of September 3rd 1884.
(2) Article 21 do. do. do. do. do.

(1) In the construction of the various works the Company must employ first class materials to ensure of their being solid and durable.

The buildings etc., must be constructed of brick or iron, unless in special cases approved otherwise by the Public Works Board.

(2) The permanent way must be laid in a solid manner with materials of best quality.

The rails used on the main line must weigh at least thirty kilogramms (30 k.) to the lineal meter and must be laid on wooden sleepers. The rails must be bolted together by fishplates and bolts, and the distance between the sleepers must not exceed ninety centimeters.

These regulations may from time to time be varied as found advisable by experience, but no Company can be allowed to adopt any other system of permanent way which has not been previously approved of by the Government.

(3) The guage of the railways shall be from 1 meter 44 cent. to 1 m. 45c.

(4) The sidings and loop lines laid in stations or elsewhere shall allow of two meters fifty centimeters clear between same and the main line.

The ballasting of the road-bed shall be made to extend at least one meter on either side of the rails.

(5) The number, size and position of the stations, stopping places, or sidings shall be decided upon between the Government and the Railway Company.

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(1) Article 22 of the Executive decree of September 3rd 1884.
(2) Article 23 do. do. do.
(3) Article 2 of the Law of August 27th 1884.
(4) Article 12 of the Executive decree of September 3rd 1884.
(5) Article 14 do. do. do.

Before commencing the construction of any station the Company must submit to the Public Works Board for their approval a general project of same that will comprise:

(*a*) A plan to scale of 1 to 500 showing the line sidings and buildings with the internal arrangements; and also the general surroundings of the neighbourhood.

(*b*) Building elevation to scale of one centimeter to the meter.

(*c*) A general account of the design explaining the principal points of same.

General Regulations.

Apart from what it lays down with respect to construction of the railway, the law of August 27th 1884 contains the following regulations:

Art. 1. The general system of railways is comprised of those included in the plan prepared by Engineers don Antonio Montero, don Cárlos Honoré, don Eugenio Penot, don Cárlos Olascoaga, don Emilio Dupret, and don Juan Alberto Capurro (who formed a Committee appointed by the Department of Public Works in October 1873), with the modifications mentioned in this law, and the Executive Power is empowered to make deviotions in the lines laid down by the said engineers without changing the route should economy or the nature of the ground render it necessary.

Art. 2. The lines referred to are the following:

I. The Central Uruguay Railway from Montevideo to the town of Rivera passing through Durazno, Paso de los Toros (Pass of the Bulls) on the Rio Negro, and San Fructuoso, with a branch from Paso de los Toros to Salto and a sub-branch to Paysandú.

II. Montevideo and Colonia Railway passing through the Barra de Santa Lucia (River Santa Lucia bar) or Belastequi pass, the Colonies and the town of Rosario.

III. The Western Railway from 25 de Agosto to Carmelo and Nueva Palmira, passing through San José, Puntas del Rosario and Puntas del Colla, with a branch to Mercedes.

IV. North Eastern Railway from Montevideo to Artigas passing through San Ramon and Melo, with a branch to Treinta y Tres, the Company having the right to run another branch from San Ramon to Minas. It can also start from Canelones, Piedras, or Pando.

V. Eastern Uruguay Railway, from Montevideo to Lake Merim, passing through Pando, Maldonado, San Carlos and Rocha with a branch to Minas from between Pando and Maldonado; that is, provided the North Eastern Railway does not make one.

VI. Railway from Salto to Santa Rosa with a branch from Isla de Cabellos to San Eugenio (1).

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(1) The Senate and Chamber of Representatives of the Republic etc. decree: —

Art. 1. Let the following paragraph be added to article 1 of the

Art. 3. The permanent way and rolling stock must always be of the best quality and in accordance with the latest scientific developments.

Art. 4. The Executive Power is authorized to enter into contracts for the construction and continuation of the main and branch lines indicated in article 1, and as soon as an offer be made for the extension of the Central Uruguay Railway, that Company will be immediately notified of the fact, so that, within the term of eight months laid down by art. 16 of the contract of 27th. November 1877 it may state whether it will effect the conclusion of the line and submit the necessary estimate; should it decide not to, the Executive Power may control the extension of the same from Paso de los Toros to Rivera.

Art. 5. The Companies cannot oppose other railways joining up with their own or crossing them above, below, or on the level, provided that the works in connection therewith do not interrupt the regular train service of the original line; in the case of a junction or level crossing, the primitive Company will carry out the necessary works, keep them in proper preservation, and will station at the point of intersection the guards and other accesories which are indispensable for the safety of both lines, all this to be at the expense of the new Company.

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law of August 27th 1834, "Para: 7, A branch from Maldonado to Punta del Este, etc.

Art. 2. Let this be communicated etc.

Sessions Hall of the Honorable Chamber of Senators, Montevideo, 23th June 1886.

PEDRO CARVE,
1st. Vice President.

Francisco Aguilar y Leal,
Secretary.

Ministry of Government.

Montevideo, July 1st 1886.

Let this be carried out etc.

SANTOS.
LUIS E. PÉREZ.

Art. 6. The Companies may not oppose the crossing of their lines by ordinary roads when the construction of the latter is ordered or permitted; neither may they oppose the construction of canals or artificial water drains which may have to cross their lines, so long as the works in connection therewith do not impair the solidity of the track nor interrupt the regular service of the trains.

Art. 7. Every Company is obliged to share the use of any of its stations with other companies whose lines join up with its own; the remuneration and other conditions of this service shall be settled by common accord.

Art. 8. When two or more lines, constructed by different companies, form a junction at one place, they may freely run their wagons and carriages over each other's lines, paying for this privilege in accordance with the conditions to be established amongst them by common accord.

Art. 9. The regulations laid down in the preceding articles will be carried into effect provided that they neither hinder nor interrupt the regular traffic of the company owning the line on whom the service falls.

Art. 10. Should the agreements to which the foregoing articles refer not hold good, as also in the case of any question that may arise between the companies with respect to the fulfilment of the obligation imposed by the said articles, the matter will be submitted to the decision of arbitrators to be named by the companies before the proper judge, who, should the arbitrators fail to agree, will appoint a third, against whose decision there shall be no appeal.

Art. 11. After they have been working twenty five years, the State will have the right to expropriate any of the lines which this law comprises, in exchange for the just value of the line at the time of expropriation, plus twenty per cent bonus.

Art. 12. The Nation guarantees seven per cent on the amount fixed as the value of each kilometer of line completed and open to public service. (1).

Art. 13. The guarantee service will begin for each section of line as it is opened to public service, but the length of each section must not be less than fifty kilometers.

Art. 14. For the service of the guarantee established in articles 12 and 13, and until the required amount is obtained, fifty per cent of the Contribucion Directa (Land Tax) is to be set aside.

Art. 15. Should the tax fixed in the preceding article not be sufficient, or should the new use to which it is to be put produce a deficit in the yearly Budget, the Legislative Power, at the request of the Executive, will create the necessary funds.

Art. 16. The guarantee service shall be effected at the end of every six months, making up the amount which the net taking of the line, after it has been calculated, falls short of seven per cent.

Art. 17. When the net takings of the line exceed eight per cent per annum, the company will return to the Government, besides the taking in excess of that rate, the sums advanced under the name of guarantee, without taking into account the interests accrued on such sums.

Art. 18. The sums expended on the line in improvements which are not included in the original projects which served as a base for the concession, will be considered as net

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(1) By the agreement celebrated in London on the 26th August 1891 between the Committee representing the holders of Uruguayan Bonds and Dr. D. José E. Ellauri, representing the Uruguayan Government, which agreement was ratified by the Law sanctioned by the Assembly on 7th Octr. 1891 and published by the Executive Power on the same date, it was arranged the railways constructed in accordance with this disposition should in future receive an interest of 3 1/2 per cent per annum on their guaranteed capital.

revenue, unless the said improvements are carried out in agreement with the Executive Power, and with newly introduced capital.

Art. 19. So long as their net takings do not exceed four per cent, the Companies can renounce the guarantee, and thus free themselves from the obligation of returning to the State the sums advanced with this object.

Art. 20. To the general Treasury of the State there shall be added a section especially for auditing and inspecting the accounts of the different Companies for the purposes of the foregoing articles: this section shall submit a monthly report to the Finance Department so that the portion of the Contribucion Directa fixed in article 14 may be set apart. (1)

Art. 21. The Companies are obliged to place every facility at the disposal of the Treasury and the Public Works Office, viz: to exhibit the books, registers and other documents which they may require to inspect in the fulfilment of their duties.

Art. 22. The Executive Power will receive proposals for the construction of the main and branch lines referred to in article 1, in all of which there must be stated:

I. The amount it is proposed to fix as the value of each kilometer of line for the guarantee of seven per cent per annum.

(This sum must never exceed L. 5000 per kilometer.)

II. The class of buildings, materials, rolling-stock, etc. it is proposed to use in the line, as also the maximum grade and the minimun curve radius.

(1) By a decree dated November 6th 1891 the National Railway Control Office was established, and Engineers Julio Leroy, Vice President of the Public Works Board, and Battiste Alcoste, with Sr. Augusto Madalena chief of the Railway department in the Treasury, were appointed members.

III. The time when the works should be commenced and concluded and the line handed over to public service.

Art. 23. On a person presenting himself soliciting the construction of a main or branch line, the Executive Power will grant a term of eight months, (which can be prolonged for four more, but cannot be extended beyond that,) for the presentation of the plans, amount of guarantee and the other requisites indispensable for drawing up the concession. During this period the Executive Power cannot arrange with any other person for the construction of the line solicited, but at the end of the eight or twelve months, whichever it be, if the tenderer has not presented his plans etc., the proposed concession will be null and void.

The concession will not be made a public deed unless the person interested proves having deposited to the order of the Executive Power in one of the Banks in the Capital, a guarantee equal to one per cent of the estimated value of the line solicited. This guarantee may be paid in money or in Debt Bonds or property titles, and in the two latter cases the interested party may enjoy the income produced by the guarantee deposited.

Art. 24. The constructors of the line may withdraw the amounts deposited as guarantee, as soon as they can prove having executed sufficient work to cover their value, the railway works remaining hypothecated for said amounts until the line is finished.

Art. 25 The guarantee deposited by the concessionaire will become the property of the State should the concession legally lapse.

Art. 26. The railway concessions will lapse if, within the terms specified in the contract, the works be not commenced, or the line, or the sections into which it is divided, be not finished.

Art. 27. Should the public service of the Railway lines be wholly or partially interrupted, the Executive Power will take the necessary steps for temporarily carrying it on, at the cost of the Companies.

Within six months the Company must show that it has sufficient means to continue working, which may be passed over to another Company or á third person, after obtaining the permission of the Executive Power.

If, even by this means, the service be not continued, the concession will be considered forfeited.

Art. 28. The interested party may appeal before the United Tribunals of Appeal or the High Court of Justice, if created, against the resolution of the Executive Power declaring the concession lapsed.

The appeal will be decided in verbal judgment within the term of one month, all the facts being before the Tribunal (1).

Art. 29. Once the line is definitely declared forfeited, the Executive Power will cause a valuation to be made of the

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(1) *Litigious Administrative jurisdiction.*—The Senate and Chamber of the Representatives of the Republic etc. etc., decree:

Art. 1. It is declared that the litigious administrative jurisdiction established in article 28 of the law of 27th August 1884, comprises all questions which may arise with regard to Railways, be they between private parties and the State or between private parties themselves, whenever they are the result of resolutions of the Administrative authority, with the exception of those referred to in article 10 of the same law.

Art. 2. Let this communicated etc.

Sessions Hall of the Honorable Chamber of Representatives, Montevideo 18 th September 1885.

IDIARTE BORDA.
1st. Vice President.
José Luis Missaglia,
Secretary.

Ministry of Government.

Montevideo, September 19 th 1885.

Let this be complied with etc.

SANTOS.
EDUARDO ZORRILLA.

works executed and of the construction and working materials on hand.

After this valuation has been verified, the line will be offered for public tender for the term of one year on the base of two-thirds of the valuation; and if within this term there should be no tender for it, it will be again offered for a period of six months on the base of one-half of the valuation: if not then sold, it will be offered, for the last time, for the same term, and for whatever price may be obtained.

Art. 30. On handing over the line to the new concessionaire, he shall pay in to a Bank to be named by the Executive Power, as a deposit, the amount of the sale which, after the expenses caused have been deducted, shall be delivered to the concessionaire whose rights have been forfeited.

The new concessionaire will deposit the guarantee fixed by article 23, and the dispositions of this law will apply to him as if he had been the first.

Art. 31. Whenever a Railway gives more than twelve per cent per annum profit on the capital invested, the Executive Power shall have the right to interfere in the fixing of the tariffs in order to reduce them, after the company has been heard on the subject.

Art. 32. The carriage of the public and official correspondence will be free of all cost in the railways to which this law refers, for which purpose a special wagon will be provided and also a cellular one for the conduction of prisoners: the use of the telegraph for official telegrams will be gratis, and free passage in the carriages of the Company will be provided for the Engineers and Government officials appointed to inspect, control and watch the railways, as also for the judicial functionaries who may go to

investigate crimes committed in the stations or trains, or to collect information about incidents that have ocurred on the line.

Police Commissaries and men, war materials and the property of the Government will be carried at one half the rates charged to the public, these services having the preference.

Art. 33. The employés of the Railway Companies will always be exempt from military service, and at least half of them must be natives of the country.

Art. 34. The Railway Companies referred to in this law will be exempt from the payment af Trade and Land Taxes, as also of duties on the materials they may import for the construction of their lines.

Art. 35. The Companies will have the power to expropriate the lands necessary for the line and for building the stations and accessories, in accordance with the ruling law of expropiation, and may take possesion as soon as they require them, after making the corresponding deposit on account of indemnity.

Art. 36. The guarantees and privileges granted by this law will remain in force for forty years, counting from the date of the concession.

Art. 37. The Executive Power will issue the decree amplifyng this law.

Art. 38. Let this be communicated, etc.

Sessions Hall of the Senate.

Montevideo, 22 August 1884.

Miguel González Rodríguez,
President.

Francisco Aguilar y Leal,
Secretary.

Ministry of Government.

Montevideo, August 27th 1884.

Let this be complied with, etc.

SANTOS.
CARLOS DE CASTRO.

The law of 27th August 1884, the dispositions of which we have just quoted, was amplified by a decree dated 3rd September of the same year giving the dispositions which we have incorporated and which form the principal part of the programme for the construction of the railways, and also those which we will now quote as follows.

Ministry of Government.

Montevideo, September 3rd 1884.

In accordance with what is established in article 27 of the law of the 27th August last; the President of the Republic accords and decrees :—

Art. 1. The Executive Power will receive tenders for the construction of the lines and branches referred to in the law promulgated on 27th August last.

Every tenderer must address himself in writing to the Ministry of Government declaring that he abides by all the dispositions and conditions established in the said law and in this decree.

He will solicit the concession of the line or branch stating the price per kilometer and other details mentioned in article 22 of the law, declaring that the Companies formed outside the country, will have jurisdictional and legal

domicile in the Republic, as well as abroad, in order to attend to any litigation that may arise.

Art. 2. Priority in the presentation of an offer confers no rights on the person presenting it, the Executive Power reserving to itself the privilege of accepting the tender which, in its judgment, offers greater guarantees as to efficacy, taking also into consideration the other advantages offered.

Art. 3. After a tender is accepted, the Notary of Government and Finance will issue to the interested person an attested copy of the minutes refering to the subject, putting as a heading the text of the law and of this decree.

Art. 4. If, at the conclusion of the time granted, the petitioner should not have complied with the conditions laid down in article 23 of the law, new tenders will be received for the construction of the line to which the concession refers.

If, on the other hand, he should have complied with these conditions, the concession will be granted him by public deed, after he has deposited the corresponding guarantee.

Art. 5. The indemnity for temporary occupation of or damage to property, interruption of work, all damages resulting from the works and caused by the surveys, will be for account of the Companies.

Art. 6. The Engineers in charge of the surveys must carry, with them the necessary permit from the Executive Power, who will inform the authorities of the various Departments, through which the projected line is to run, and the local authorities will inform the owners of the various properties, by means of notices fixed for fifteen days in the Judges offices and principal meeting places in the camp, and in the newspapers of the Capital and the locality.

Art. 7. At the expiration of this term, the engineers can enter the precincts of the properties, and should they meet with opposition, will appeal to the local Judge of the Peace.

Art: 8. The damages caused by the surveys will be valued by the interested party and the engineer in charge, who should be duly authorised for this purpose by the Company he represents.

In case of disagreement, they will proceed according to law.

Art. 9. The concessionaire must not commence any work in connection with the Railway or its dependencies without the permission of Government. To this end, plans of all the works to be executed will be submitted to the approval of the latter, who, after receiving the report of the Public Works Department, will determine the modifications that may be necessary.

Those plans, after being approved by the Government and sealed and signed by the respective Minister, will be passed to the Archive of the Public Works Department.

The concessionaire will, at his own expense, take two copies, which will be attested by the Public Works Department: one of these will be delivered to him and the other will remain with the Department for inspection.

Both before and during the execution of the works, the concessionaire wil have the right to propose any modifications that he may consider useful in the projects presented.

These modifications cannot be carried out until they have been approved by the Executive Power, after consultation with the Public Works Department.

Art. 10. The concessionaire can, at his own expense, take copies of all plans or documents referring to his concession that are archived in the Public Works Department.

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Art. 24. It is forbidden, at a less distance than twenty meters from a line on which locomotives run, to :

1.) Construct works which endanger the solidity of the track, such as excavations, quarries or mines.

2.) Construct buildings of straw or to deposit in the open air explosive or inflammmable matters.

Art. 25. All the lands necessary for the establishment of the railway or its dependencies, sidings (public or private) deviation of streams, rivers, or canals, and, in general, for the carrying out of any works whatever originated by the construction of the railway, will be expropriated by the State and paid for by the concessionaire.

Art. 26. After the route has been approved, the conces sionaire will propose the amounts to be offered to the persons interested as indemnity for expropriation. If these be not accepted, the Attorney of Finance will go to the place where the land in dispute is situated, and after the approximate value of the properties to be expropriated has been approved by the Judge, in accordance with the law, the concessionaire will deposit the amount, receiving immediate possession of the land.

Art. 27. The Companies cannot sell expropriated lands without previously advertising for thirty days their intention to do so, and should the former owners or their successors present themselves within this term, they will have preferential right of purchase.

Art. 28 The construction of the Railway having been declared of public utility, the concessionaire will enjoy all the privileges which the laws, decrees and regulations confer on the Government with regard to public works, both in the acquisition of lands, and for the extraction, trans-

port and deposit of earth, stone, sand or any class of materials, and will be subject to all the obligations imposed on the State by the said laws, decrees and regulations.

Art. 29. Should the Railway cross a piece of land already granted for working a mine, the Department of Public Works will indicate the measures to be adopted by the concessionaire in order that the establishment of the railway does not prejudice the working of the mine, and also that the latter does not endanger the safety of the railway.

The works of support that it may be necessary to carry out in the interior of the mine, on account of the passage of the Railway, and all the damages that may result both for the concessionaire and the owner of the mine, will be for account of the Railway.

Art. 30. The concessionaire will execute the works with the means and the materials he may choose, but will always be under the inspection and control of the Public Works Department, the object of such inspection and control being to prevent his departing from the prescribed conditions and from those laid down in the plans adopted.

The Company is obliged to fence both sides of the lines and when it crosses camps belonging to private parties, arrangements to this end in accordance with the ruling laws must be made (1).

Ministry of Foment.

Montevideo, July 9th 1891.

Considering that it is of the greatest public convenience to adopt the necessary means for avoiding accidents that may occur on the railways, especially at level crossings in populated districts:

Considering also that the campowners have a perfect right to require that the Railway companies shall take such measures as will protect their cattle on the estancias, frequently maimed and killed by trains in transit:

Considering also that although the Governments may require the Railway Companies to take the above precautions indispensable for

Art. 31. As soon as a section of the line be finished, the concessionaire will ask that it be qualified for public service, and the Public Works Department will proceed to inspect it, and if they think fit, to provisionally accept it

This inspection will be carried out by one or more engineers appointed by the Public Works Department.

According to the report of this office, the Government will authorize or otherwise the delivery of the section to public service, but partial receptions will not become final until after the general reception of the whole line conceded.

Art. 32. After the works are concluded and within a period to be fixed by the Public Works Department, the concessionaire will, at his own cost fix the land marks and prepare the land plan of the railway and its dependencies.

He will also, in agreement with the office named, prepare a statement of all the works of art constructed: this statement will be accompanied by an atlas with plans of these works.

One duly certified copy of the land plan, of the descriptive statement, and of the plans must be made at the cost of the concessionaire for the archive of the Public Works Department. Any lands which the concessionaire may

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the objects mentioned, it is at the same time inconvenient to restrict railway construction with heavy and in many cases uncalled-for expenses, in view of the actual traffic and the considerable extent of line:

Considering also that the wire fencing required on both sides of the line throughout its entire length, by art. 30 of the Regulating decree of September 3rd 1884, has been recognised in practise by other countries as unnecesary, and even under some conditions dangerous, especially in those countries whose territory in regard to population and setrlement is more or less similar to this:

The President of Republic decrees--

Art. 1. The Railway Companies must fence the boundaries of the line, where it crosses private property in the country, when called upon by the owners to do so according to the dispositions of articles 704 to 710 of the Rural Code on Fencing.

Art. 2. The Companies are obliged to fence the line on both sides at their own expense near the populated centres, also the

expropriate or acquire after the general marking out to satisfy the necessities of the working of the line, will be marked out and added to the plan as they are acquired. In the same way will be added to the atlas of works of art, plans of all those constructed after the preparation of the atlas.

Art. 33. The Railway and all its dependencies shall always be kept in good order so that circulation shall be safe and easy.

The cost of preservation and of ordinary repairs, shall be at the sole charge of the concessionaire.

If, after the Railway is concluded, it be not always kept in good order, the Department of Public Works will order what is necessary to be done, and should the concessionaire not commence the works ordered within twenty-four hours, or if, having begun them, should not continue them without interruption, the said office will proceed to carry them out at the cost of the concessionaire, without prejudice to the dispositions laid down in the law of the 27th August last. The amount of the advances made in this mnaner will be charged by means of statements certified by the Department of Public Works and they will be collected in the usual manner.

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full length of any wood and forests, in accordance with the instructions of the Public Works Board.

Art. 3. The Companies must also erect barriers attended by road-guards at the level crossings in populated districts considered dangerous by the Public Works Board.

Art. 4. The Minister of Foment is appointed to see that the present decree is complied with, obliging the Companies to strictly comply with art. 17 of the Regulations on the General Railway Law, as also the form and plan on which to make the level crossings or erect barriers, in accordance with the limitations of art. 2 of this decree.

Art. 5. The decrees and regulations which in any clauses are not in agreement with the dispositions of the present, are revoked.

Art. 6. Let this be published, etc.

HERRERA Y OBES.

JUAN A. CAPURRO.

Art. 34. The concessionaire must provide at his own cost, and wherever the Public Works Department thinks it necessary, road-guards in sufficient number to ensure the free transit of the trains on the line and the ordinary circulation in the level crossings over public roads. (*)

Art. 35. The passenger carriages will be built according to the best models and must satisfy all demands as regards cleanliness and space.

They will be suspended on springs and provided with seats.

There will be at least two classes of carriages.

The 1.st class carriages will be covered, padded and closed in with glass and curtains. The second class will be covered, closed in with glass, and provided with padded seats and curtains.

The number of seats will be indicated inside each compartment.

The rolling stock for passengers, cargo, or any other use shall be of good and solid construction in all its parts.

The engines and coaches or vehicles which compose the rolling stock shall be always kept in good order, and none which have been temporarily repaired shall form part of a passenger train.

Art. 36. Powder and other explosive articles must be transported in trains which do not carry passengers, but this rule does not apply to the small quantities taken by sportsmen for their own use.

Art. 37. In the event of internal disturbance or invasion by foreigners, the State can make use of the Railways for its own account, paying the Companies a proportional compensation, the base for determining which shall be the

(*) See the decree respecting road-guards farther on.

average takings of the line during the past year. When the State has finished with the Railway, it shall be returned in the same state as received, fair wear and tear excepted.

Art. 38. The articles to be carried by the Railways shall be classified in the following manner:

A. Luggage and parcels.

B. Merchandise.

Art. 39. Under the head of luggage are comprised: the trunks, boxes, portmanteaux, hat cases, bags, and, generally, the packages belonging to and accompanying passengers.

By parcels will be understood loose or single packages which require special care and which are carried at the same speed as passengers. All articles not included in the foregoing classification will come under the head of merchandise.

Art. 40. All merchandise handed in for carriage by the Railways must be in good condition and must show the number, class and quality, the name and address of the remitter and consignee, and the station where it is to be sent.

For the carriage of those articles liable to produce explosions or fire, or whose deterioration or proximity may damage other goods, special precautionary measures will be taken.

Art. 41. The obligations or responsibilities of the Companies with regard to the loaders for loss, damage, or delay in the forwarding or delivery of merchandise, shall be determined by the dispositions of the Commercial Code (Chap. 5, part. 3, Book 1.

In all questions not provided for by this law, the Railway Companies will be subject to the dispositions of the

general transport laws, as also to those determined by the Custom House rules and regulations.

Art. 42. The Company will not be responsible for deficiencies in or damage to the contents of a closed case or package, provided, its exterior does not show breakages or signs of being opened which did not exist at the time of its delivery to the Company.

Art. 43. The Companies have the right to reject packages presented in bad condition, as also, merchandise liable to damage, and those whose packing are insufficient to preserve them. However, should the remitter insist on their being admitted, the Company is obliged to carry them, but will be free from any responsibility with respect to them, and will note their objection on the way-bill.

Art. 44. The way-bills delivered to the guards of goods trains, will be evidence in favor of the owners who have lost theirs, provided that they prove their identity.

Art. 45. Should a package contain merchandise of different classes for which different tariffs are fixed, the highest of these shall serve as a base for the transport charge.

Art. 46. The Companies are responsible to the loader for the substractions, losses, or damage to the effects delivered to them, except in the case of accident or force majeure.

The exoneration of the Company from liability can however be agreed upon, in which case it will only be responsible for the faults or omissions of its employés.

Art. 47. If the Company should not, directly or indirectly, mediate in the loading of merchandise in wagons hired for their carriage, they will not be responsible for the deterioration that may happen.

Art. 48. The Companies will not be responsible for the

natural waste of merchandise, provided that this does not exceed ordinary proportions and does not arise from fraud or negligence.

Art. 49. On the arrival of the cargo at its destination, should there result any deficiency or damage at the time of delivery, claim must be made at once to the Station master, who will give the corresponding certificate. If, thirty days after the claim has been established, the missing cargo should not have appeared, the Company will pay for it.

Art. 50. The regular passenger trains will be composed of carriages of all classes in sufficient number to carry all the persons who may present themselves at the ticket office.

Art. 51. In cases where the Company may reduce the whole or any of the tariffs, subject to certain conditions or otherwise, they will not be allowed to again adopt the original rates without at least a month's notice when treating of passenger fares, or three months when of goods rates.

All alterations in the tariffs must be published a month in advance by public bills, and in the newspapers of the Capital.

Art. 52. Any private arrangements made by the Company outside the authorized tariff will, for the purposes of the Government guarantee accounts, be treated as the private business of the Company, and the receipts of the line will be credited with the amount such traffic would have produced at the authorized tariff rates.

Art. 53. The Company will be required to always perform with due care, precaution, and promptitude, and without favour, the transport of passengers, animals, merchandise, or any other articles remitted by them.

In both the despatching and receiving stations, the

goods, cattle, etc. must be noted when dealt with in the books provided; also the despatching station must make an entry of the total amount of the freight for carriage.

The despatch of several consignments of goods for the same place, must be made according to the order of reception as shown by the book entries.

For each consignment despatched a waybill must be given to the sender setting forth the class and weight of goods remitted, the total amount of freight and the time which is allowed to the Company for carriage to destination.

Art. 54. Cattle, general goods or any other articles must be despatched from and delivered under the following conditions fixing time allowed for carriage.

The maximum time allowed for any journey will be fixed by the Public Works Board when requested by any Company to do so.

Such maximum must not exceed 22 hours for each 125, kilometers or any part thereof

Animals consigned to any station before mid-day must be sent on to destination within six hours counting from the time of reception, and they must be put at the disposal of the consignee within two hours of their arrival.

Goods traffic must be placed at the disposition of the consignee on the day following its arrival in any station.

The Company is only bound to comply with the time stipulated as the maximum for the carriage in the preceding paragraphs.

Art. 55. The Company may, if it finds it convenient so to do, undertake themselves or by responsible agents, the collection from and delivery to the houses of business of senders or consignees of any goods that may be entrusted to their charge, but this shall not deprive private individuals of also exercising the same rights.

Art. 56. Whenever the Government may require to send troops or war material to any point touched by the railway, the Company is under the obligation of carrying same immediately either by special or ordinary train, placing at the disposal of the authorities all the means at command.

Art. 57. The Post Office mail service will be carried as follows:

(1) In each booked passenger or cargo train indicated by the Government, the Company must reserve free of charge a special vehicle for the reception of correspondence and for the employees of the Post Office.

(2) The Company shall give at least fifteen days notice to the Postmaster General of any intention to change the time table of the trains.

(3) Whenever the Government may require a special train, outside the ordinary service, by day or by night, it must be at once placed at their disposition, without being allowed to interfere with the ordinary traffic. The tariff rate will be afterwards arranged between the parties or by arbitration.

(4) The Postmaster General will decide as to the form and size of the cars for the transport of the correspondence, being previously advised by the Public Works Board, on the technical points to be considered in studying regularity and safety of transit.

The Company will construct and maintain these cars at their own cost.

(5) The Company must provide in the terminal stations of the line, also in the principal intermediate stations as required by the Postmaster General, at their own expense a site on which may be erected such offices, stores or sheds as may be necessary for the service.

This site shall be of the convenient size considered necessary.

(6) The position of the buildings erected by the Post Office must be so chosen as not to disturb the railway service.

(7) The Post Office employees shall be allowed access to all stations for the execution of their duties, in this being governed by the regulations for the ordinary railway employees.

Art. 58. The special wagons for the conveyance of prisoners must be constructed and maintained at the expense of the Company, the Public Works Board determining their shape, size and arrangement.

Art. 59. The Company is bound to establish the electric telegraph throughout the whole line for the purpose of attending to the service requirements of the railway and of the National Offices.

The form and system of construction of the telegraph line, also the organization of the service, will be subject to the approval of the Government.

The supervision of the telegraph lines, both of the Company and the Government, erected alongside the railway must be performed by the Company.

Art. 60. When the Government may order or authorize the construction of any highways, roads, railways or canals that cross the line authorised by a prior concession, the concessionaire will not be allowed to oppose the works, but the Public Works Board will lay down the necessary rules to ensure there being no interruption in the construction, or in the Railway service, nor expense to the Company.

Art. 61. Further than the technical inspection entrusted to the Public Works Department, the Government may

name one or more Inspectors or special Commissioners to revise and attend to the business of the Company.

Art. 62. The Railway Companies are responsible for the acts committed to the detriment or injury of passengers by their employees in the discharge of their duties, without distinguishing between such acts as may have been performed through negligence or intentionally.

Art. 63. The Companies will be held equally responsible for any loss or damage occasioned by collisions between their trains and those of any other Company that may have acquired permission to use their line.

Art. 64. The employees of the Railway may arrest any persons found, in the trains or elsewhere, preparing to execute or executing acts that might prejudice or endanger the lives of passengers, or damage the property, or interfere with the march of the trains, and they must deliver them prisoners as soon as possible to the nearest police authority making before them the formal accusation.

Each passenger coach must be provided with an electric bell-push communicating with the alarm bell for the guard of the train, who must immediately attend to any call.

Art. 65. Any forcible resistance to the Railway employees in the execution of their duties, will be dealt with by the ordinary police authorities provided that the case is not sufficiently serious to come under the jurisdiction of the Criminal Code.

Art. 66. No persons other than those in the execution of their duties will be allowed to enter or walk on the line. The driving of animals along the line is also prohibited although they may be driven across the line, but the person in charge must be careful not to cross when a train is approaching.

This regulation also applys to cartmen or drivers of other

vehicles, who will only be allowed to cross the line at the level crossings.

Art. 67. Any person who may suffer loss or damage through noncompliance with the above regulations shall have no legal right of claim against the Company, unless he is able to prove that notwithstanding his own negligence, the occurrence might have been avoided.

Art. 68. In each station there must be prominently exposed the time tables, list of passenger fares, and goods tariffs rates, for the information of the public.

Art. 69. Every change or modification of time table or tarifts must be published in at least two newspapers for one month, when referring to passengers, or three months, to goods, before coming into force.

Art. 70. Each Company must draw up the service regulations for the guidance of the staff, and must submil same for the approval of the Government within two months after opening the first section to traffic.

Art. 71. Each Company must keep a register of all accidents or other notable occurrences, and must place same at the disposition of the National authorities whenever called upon to do so.

Art. 72. Each station must be provided with a register which shall be revised periodicasly by the Public Works Board or the National Railway Inspector, for the public to note any complaints against the Companies or their employees.

Art. 73. Let this law he made public.

SANTOS.

Carlos de Castro.

Railway Law.

(AMPLIFYNG THAT OF 27TH AUGUST 1884).

Legislative Power.

The Senate and Chambers of Representatives of the Oriental Republic of Uruguay, united in General Assembly.

DECREE:

Art. 1. The following lines will form part of the general railway system established by the law of 27th August 1884, in addition to those therein specified.

I. A railway from the city of Durazno to Trinidad, forming a junction with the Central Co.

II. A railway to the frontier by the Bagé road, joining with the Northeastern line at Cerro Chato (Puntas del Yi).

III. A branch, from Pando to Minas, of the Northeastern line which runs from Montevideo to Artigas, passing through Pando, San Ramón and Villa de Melo, with a branch to Treinta y Tres.

Art. 2. Should the line from Montevideo to Colonia, as also the extension of the Western line, be constructed by the State, their route shall be as follows: — the main line from Montevideo to Mercedes and Independencia, passing through Rosario Oriental and following the mountain ridge between Colla and Rosario until it joins the Cuchilla Grande (Great range) and following the latter as far as Mercedes, with three branch lines, one from Rosario to Colonia another from Puntas del Perdido to Carmelo and

Palmira, and a third to Dolores running along the ridge which divides the water from San Salvador.

Art. 3. The regulations of the law of 27th August 1884 with respect to the junction and service in connection therewith will apply to the main and branch lines authorised in the preceding decrees.

Art. 4. The Executive Power is authorised to contract for their construction either for the account of the State or through a concessionaire.

Art. 5. In the same way the construction is authorised of broad or narrow gauge railways intended to afford direct communication, both locally and with the capital, to camp towns and other rural centres. The cost of these lines must not exceed three thousand pounds sterling per kilometer, including rolling-stock, stations, telegraph, etc.

The Executive Power will either submit the general plan of these lines to the Legislative Council for approval, or will in each case ask for the necessary authority to contract for ther construction.

Art. 6. In the concessions which may be granted, in conformity with art. 4 of this law, the Executive Power may grant a maximum guarantee of 7 % on the maximum price of five thousand pounds sterling per kilometer of road ready for public traffic: this guarantee to last for 33 years from the date of granting the concession. If on account of difficulties in the route to be traversed, the real cost should exceed L 5.000 stg. per kilometer, on this being verified by the Government technical offices, the Executive Power shall fix a proportionate rate of guarantee interest on the legal value per kilometer of the line (which value must in no case exceed L 7.000 stg.), so that the total sum to be paid them will be same 7 % on L 5.000 per kilometer as fixed in the preceding paragraph

Art. 7. In every contract of concession must be stipulated the maximum tariffs which the Company may charge the public, and the Executive Power will have the right to exact a reduction in them and to intervene in the compilation of the new ones, should the Railway return more than 8 %. In such case, the reduction of tariffs will be limited to the excess over 8 % which may be payable to the State as returned guarantee in accordance with art. 17 of the law of 27th August 1884.

Art. 8. No concession whatever will be granted except on condition that, 90 years after being granted, the line becomes the property of the State, without any remuneration whatever.

Art. 9. Relinquishment of the guarantee in accordance with article 18 of the law of the 27th August 1884, will not exonerate the Companies from the obligations imposed by this law.

Art. 10. Any Concession granted by the Executive Power, the conditions of which have not been complied with within the periods fixed by art. 23 of the said Law, will be declared forfeited, no matter what may have been the obstacle to carrying out the same.

Art. 11. The questions which may arise between private persons as to prior right to a concession, even though not yet granted, will be shortly and summarily decided by the Executive Power, against whose decision the Supreme Court of Justice, or the Tribunal representing it, may be appealed to. Their decision must be given within thirty days at the latest, no excuse of any of its members or other incident which may delay final judgment being admitted.

In the case of concessions already granted action can only be taken against the State: these questions shall be resolved in the form and according to the procedure above established.

Art. 12. For the payment of the railways constructed for the national account, the Government will issue Public Debt bonds to be called "Railway Bonds" bearing 6 % annual interest payable quarterly, and 1 % amortization payable annually and these bonds shall be specially guaranteed by the railways which erew constructed by them, the earnings of same, and by the general national revenue. These bonds may be redeemed at anytime at par value.

Art. 13. The construction of railways for the account of the nation shall be undertaken at a fixed cost per kilometer, but ith the object of wassisting the contractors the Government may arrange with them the separate valuation of the various items it being understood that the total shall be within tho kilometric cost.

Art. 14. The maximum cost per kilometer will in every case be fixed by the proper Departments based on the technical studies, and in accordance with same general tenders will be asked for which must not exceed the stipulations of articles 5 and 6.

Art. 15. The Government will pay for these lines in sections as completed and handed over to public service.

Art. 16. When the Government have accepted the most advantageous tender. and thus determined the cost of the line to be constructed, it shall issue the necessary amount of Bonds to make the payments when convenient. The Government are empowered to negociate these Bonds depositing the amount in a bank, to be devoted solely to the payment of the construction of the line. or they may pay same to the contractor at the rate agreed upon in the contract, which rate shall on no account be less than 85 % of their nominal value.

Art. 17. In accordance with the Law of June 25th 1860 the construction of all national railways shall be publicly

tendered for, and the applicant whose proposal may be accepted shall deposit a guarantee of one per cent of the total amount of the contract.

Art. 18. The concessionaires of the lines already assigned to private individuals, by the Government, for construction for the account of the Nation, under the Law of 1884, are exempted from the stipulations of clause 17.

Art. 19. The Government will each year draw up the tariffs for the various national railways and will submit them for the approval of the Legislative Chambers, without which formality no change must be made in the existing rates.

Art. 20. The Nation may at any time expropriate the railways held by any private Company, in accordance with the general law of Expropriation, always provided that in the concessions already granted this clause is not specially legislated upon to the contrary.

Art. 21. Those articles of the law of August 27th 1884 not in accordance with those of this law are hereby repealed.

Art. 22. The Government will issue regulations for the promulgation of the present law.

Art. 23. Let it be published, etc.

Hall of Sessions of the Assembly, Montevideo, November 28th 1888.

FERNANDO TORRES.

Francisco Aguilar y Leal,
Secretary of the Senate.

Manuel García y Santos,
Secretary of the Legislative Assembly.

Ministry of Government.

Montevideo, November 30th 1888.

It is hereby decreed that this be complied with, communicated to whom it may concern and inserted in the National Registry.

TAJES.
JULIO HERRERA Y OBES.

Law

RELATING TO THE CONCESSION OF THE URUGUAY INTERIOR RAILWAY.

It is hereby decreed by the Senate and House of Representatives of the Oriental Republic of the Uruguay assembled in Council:—

Article 1. The Government shall contract with Messrs. Castro Petty and C.º (1) for the construction and delivery to traffic of the Uruguay Interior Railway, starting from the port of Colonia and reaching the Brazilian frontier, passing through Trinidad, Durazno, and Cerro Chato, in accordance with the stipulations of the laws of August 27th 1884, November 30th 1888, and the Executive decree of September 3rd 1884, on such points as are not in opposition to the present law. The line will be divided into three sections: the first extending from the Port of Colonia to the town of Durazno, running through Perdido;

(1) The actual concessionaires are Messrs. Collet Castro & Cº.

the second from Durazno to Yí or Cerro Chato, forming a junction with the North-Eastern Railway; and the third from Yí or Cerro Chato to the Brazilian frontier in the direction of the road to Bagé.

Art. 2. The concessionaires must present definite surveyed plans of this line within eighteen months from the date of the concession, and within three years from the date of their approval the first section from Colonia to Durazno must be completed and opened to public service, the other sections to be finished two and four years later respectively.

Art. 3. The National Government guarantees to the concessionaires an annual interest of six per cent (6 %) on the capital invested in the construction of the line, on a cost of £ 5.000 per kilometer.

Art. 4. The concessionaires are authorized to construct in the port of Colonia, and on the lands they acquire, the wharves and storesheds that may be required to facilitate the business of the line, the Government determining in due course, in agreement with the concessionaires, the regulations for the general management of same, and establishing the charges to be made for storage.

Art. 5. Whenever it may be compulsory, in the arrangement of the general plan of the line, to use the public streets of any town or city crossed by the railway, the concessionaires are empowered so to do, free of charge, subject to the regulations laid down by the Executive decree of September 3rd 1884.

Art. 6. The tariffs of rates and fares shall be mutually fixed by the Government and concessionaires.

Art. 7. The freight on the transport of the materials used for the construction of the line shall not be considered as a source of income when arranging the guarantee accounts.

Art. 8. The concessionaires undertake to establish an agricultural colony of at least five square leagues in extension between Durazno and Cerro Chato.

Art. 9. Let this law be published.

Sessions Hall of the Senate.

Montevideo, Setptember 4th 1889.

Xavier Laviña,
1st Vice President.

Francisco Aguilar y Leal,
Secretary.

Montevideo, September 5th 1889.

The Legislative Chambers yesterday sanctioned the law which I now have the honour to pass to the Executive Government, authorizing the contract with Messrs. Castro Petty and Co. for the construction and opening to traffic of the Uruguay Interior Railway from the North of Colonia to the Brazilian frontier. I take this opportunity of assuring the Executive Government of my sincere respect.

Xavier Laviña,
1st Vice President.

Francisco Aguilar y Leal,
Secretary.

To the Executive Government of the Republic.

Ministry of Government.

Montevideo, September 6th 1889.

It is hereby decreed that receipt be acknowledged of the above law, and that it be communicated, published, complied with and passed to the National Registry.

TAJES.
Julio Herrera y Obes.

We will now recapitulate the early steps connected with the commencement of the first line of railway constructed in the Republic.

In 1865 the concession for the Central Uruguay Railway was granted to Mr. Senen M. Rodríguez who made over his privilege to a syndicate of capitalists including Messrs. Daniel Zorrilla, Antonio M. Marquez, Juan M. Martinez, John D. Jackson, Thomas Tomkinson, James Cibils, John Mac Coll, Joaquin B. Belgrano, John B. Capurro and John Proudfoot, who in turn organized the Company denominated the Central Uruguay Railway Company, of which they formed part as the founding members. At the same time the Decree of October 4th 1866 was promulgated to indicate what method of procedure should be adopted in the construction of the first sections of railway constructed in the Republic, and it established that the line should run from the Plaza Artola or most convenient site to the town of The Union being continued from there to Durazno via Piedras, Canelones, Santa Lucía and Florida, with the right for the Company to extend the line to the Brazilian frontier and granting the following concessions:

(a.) State guarante of 7 % annual interest on the capital expenditure of £ 10.000 per English mile of 1609 meters constructed, for the term of forty years.

The arrangement of this guarantee would be made annually by the payment of the difference that should result between the amount of the net profits of the line and the total sum of the guarantee.

In order to arrive at the former amount 55 % of the gross receipts would be recognised as working expenses.

(b.) Exemption from all duties during the term of the guarantee on all materials imported for the exclusive use, construction and consumption of the railway.

(c.) Exemption, for the term of forty years from the date when the whole line was opened to traffic, from all property duties or taxes for the Company's property.

(d.) Exemption from military service of all the employees engaged in the construction, management or service of the line.

(e.) Free use of all public roads for the laying down of the line with the obligation on the part of the Company to take all possible precautions for the public safety.

(f.) Cession to the Company of any national or municipal lands required for the purposes of the railway construction, and the right of use of any public plaza similarly required.

(g.) Expropiation for the private account of the Company on the plea of public utility of any private properties required for the construction of the line, executing such acts in strict accordance with the law on such matters.

(h.) The right to construct branches with the previons consent of the Government from the main line, which branches shall also enjoy the guarantee of 7 %.

(i.) The Government in the desire to assist such enter-

prise as would enrich and increase the prosperity of the Republic would voluntarily subscribe for 2000 shares so soon as the construction works might be commenced paying for same by monthly instalments of £ 2000.

The Company for their part undertook—

(*a.*) To repay to the State the sums that might be so paid as guarantee with the half of the net profits of the line over and above 7 % interest on the capital during the duration of the forty years of the concession.

(*b.*) To construct the line and its appurtenances in the most solid manner possible, adopting the 4 feet 8 ½ inch guage, and terminating the section to Durazno within six years after the commencement of the work.

(*c.*) To carry the public correspondence free, to transmit the public telegrams free, also to carry at half the public tariff rates the troops, war material and national property, giving preference to such official services.

(*d.*) To erect at their own expense, when called upon by the Government, the electric telegraph throughout the extension of the line, placing same at the disposition of the Government whenever called upon.

The Government reserved the right:—

(*a.*) To intervene in the making of the tariffs whenever the net profits amount to 16 %.

(*b.*) To intervene in the Companys operations under any of the special concessions granted.

(*c.*) To inspect the works of the railway both during and after construction.

It was at the same time established:—

(*a.*) For the payment of the service of the deficit which as guarantee corresponds to the state to pay after the line was opened to public traffic either in complete or partial sections the Departmental Councils of the Capital,

Canelones, Florida, Durazno, and any other point to which the line may be carried, shall contribute the half of their net revenue after paying their respective expenses.

(*b.*) Any questions between the Company, the Government, or private individuals, shall be settled by arbitrators appointed mutually by both parties.

With the idea of giving what impulse they could to the construction of the Central Railway, on January 14th 1868 the Government issued a decree authorizing the Sindicate to offer, in the name of the State, the transfer of the concession of the line to an English Company with a guarantee of 8 % per annum to be paid from the national revenue on the actual cost of construction under the Government control, also sanctioning the change in the constitution of the new Company.

The guarantee was thus increased 1 % whilst the other concessions granted by the decree of October 4th 1866 were only modified in the part relating to the amount of capital on which the guarantee would be paid, this being admitted as the cost of the construction made under the Government control.

This latter change on the decree of October 4th 1866 notwihstanding the increase in the amount of the guarantee by 1 %, it would appear did not meet the views of the Concessionaires as the line was constructed as far as Durazno under the original decree of October 4th 1866.

The Company of the Central Uruguay Railway was reorganized by an agreement made on February 25th 1878 between the Executive Power and Messrs. Cooper, Capurro and Weldon on behalf of the Company, by which the guarantee stipulated and accorded as in clause *a* of the concession of October 4th 1886 was cancelled, the other concessions as indicated in the remaining clauses being

confirmed as also the Company's obligation under clause *c*, and the right of intervention reserved by the Government under clause (*a*).

It was further stipulated, in addition to the original clauses of the concession which formed part of the new agreement, that the Government undertook, to assist the Company for a term of ten years with an annual subvention of $ 5000, — payable half yearly; the Company promising to do all possible to raise abroad the necessary capital to continue the line to the other side of the River Yí.

The Government agreed to give up the 5000 shares held by the State in the Railway the same to be at once destroyed; they promised to pay to the Company all sums owing for any services or guarantees over due; the Company undertook to obtain previous authorization from the Government for the construction of any branch lines off the main line, it being likewise agreed on the bases of this concession that the Company might continue the line to the Brazilian frontier. The line would belong in perpetuity to the Concessionary Company, the privileges and exemptions being continued for a period of forty years from the date of this agreement which annulled all previous concessions to the present.

The concessionary Company began the construction of the large iron bridge that spans the River Yí and the section from Durazno to the station North of the Yí was opened to public traffiic in 1879.

On September 24th 1884 the law was promulgated authorizing the Executive Power to contract with the Central Company for the continuation of the line from the River Yí to the North side of the River Negro in Paso de los Toros under the follwing stipulations:

The Government would pay to the Company £ 500 per mile of the mentioned extensión, in special bonds to be called "Advancement of Railway bonds" (Fomento of Railways) bearing 4 % per annum. The Company would commence to amortize the bonds received for the construction of the line two years after the date of their delivery with the surplus of the 8 % of the net receipts of the whole line from Montevideo to Paso de los Toros, inasmuch as might be earned. The bonds of the Fomento of Railways would be delivered by the Government as soon as the line was opened to traffic to the North bank of the Río Negro, and the interest would be paid on the same dates as fixed for the service of the "Central Uruguay Railway debt."

It is obligatory on the part of the Company to submit to the Government. whenever called upon so to do, the books registers and other documents that may be required to be verified to comply with the terms of the law, and any neglect to fulfill this clause will relieve the State from the fulfilment of the obligations contracted.

The extension mentioned was constructed and the Central Company were authorized to definitely open same to public traffic by the decree of February 17th 1887.

The progress of the construction of the railway system in 1884 represented 411 kilometers 700 meters opened to public traffic as follows.

Central Uruguay, Montevideo to Yí . . .	209.
" " Branch to San José. . .	33.
North Western of Uruguay	112.3
Uruguay North Eastern.	34.4
Northern to Santa Lucía	23.

At that time the Legislative Chambers passed the Law of August 27th 1884, promulgated by the Decree of September 3rd of the same year and with that law was incorporated with admirable foresight the general plan of the Railway system proposed by the Commission of Engineers above mentioned, and on that date was realized one of the achievements that has most contributed to our grand future and the prominent position that our system will serve in the quick service of Central South America.

By the following comparison the difference in the conditions established under the two Laws will be observed.

LAW OF 1884.	LAW OF 1888.
(*a.*) Perpetual concession.	Concession for ninety years at the expiration of which the line becomes the property of the State without any indemnization.
(*b.*) Guarantee for a period of forty years of 7 % on a maximum capital outlay of £ 5.000 per mile.	Guarantee for a period of thirty three years of from 5 to 7 % according as the maximum cost of construction may be £ 5.000, or in exceptional special cases may cost £ 7.000 per kilometer.
(*c.*) Right of the Government to intervene in the making of tariff rates when the line earns more than 12 %.	A stipulation in each contract of concession as to the maximum rate that the Company shall be allowed to charge the public, the Executive Power being authorized to demand a reduction of same and intervene in their formation when the line earns more than 8 % the reduction thus made being limited to that share of the interest which over and above the

	8 % would correspond to the State as a return of the Guarantee in accordance with article 17 of the law of August 27th.
(*d.*) Right of the State to expropriate any railway after it has been opened to traffic for 25 years, paying a fair valuation of the property at such time plus 20 % for the goodwill.	Right of the State to expropriate any railway at any time in accordance with the general law of expropriation.
	(*e.*) Authorises the construction for the account of the State of railways of general utility or merely of local advantage, the Executive Power being empowered to issue Railway Bonds, at 6 % interest payable quarterly with 1 % amortization payable annually, to meet the cost of same.

In the agreement celebrated in London on August 26th 1891 with reference to the conversion and consolidation of the External Debts, creation of new bonds and the consequent interest service, a modification was made in the part referring to the Railways as regards the rate of interest guaranteed on their capital in accordance with the law of 27th August 1884.

The contracting parties; on the one hand, the Government represented by their financial Agent Dr. José E. Ellauri, and on the other hand, the Central Uruguay Eastern Extension Railway Company, Limited, the Central Uruguay Northern Extension Company Limited, the North Eastern of Uruguay Railway Company Limited, the Midland Uruguay Railway Company Limited, the North-

western of Uruguay Railway Company Limited, and the Uruguay Northern Railway Company Limited, arranged the conditions of the guarantees and their services as set forth in the following articles of the agreement above referred to.

" Article 15. The Guarantees by the State of interest given by any existing Law to all or any of the Railway Companies mentioned in Article 1 shall be reduced as from and after the 31st of December, 1891, from 7 to 3 1/2 per cent. per annum on the sum £ 5.000 per kilometes during the remainder of the respective periods of guarantee fixed by the Laws and Concession under which they are payable. The amount of the reduced interest so guaranteed shall be paid in London direct by the Bankers to the said Railway Companies by equal quarterly instalments on the 1st of May, August, November and February, in each year, in respect of the quarters ending in Marh, June, September and December, the first payment to be made on the 1st of May, 1892.

" Article 16. The net earnings of each Railway Company during each year ending 31st of December shall be applied in the following manner:—

1st. When the net earnings do not exceed 1 1/2 per cent. per annum on the sum of £ 5,000 per kilometre they shall be retained by the Railway Company for its own use, without making any deduction whatever from the guarantee.

2nd. When the net earnings exceed the 1 1/2 per cent, mentioned in the last paragraph, which is to be retained by the Railway Company, the excess up to 3 1/2 per cent., that is to say, from 1 1/2 per cent., to 5 per cent., always on the sum of £ 5,000 per kilometre shall be applied to reduction of the interest guaranteed by the State.

3rd. When the net earnings exceed 5 per cent. the excess up to 6 per cent. per annum on the sum of £ 5,000 per kilometre, shall be retained by the Railway Company for its own use.

4th. All sums received up to now and to be received hereafter by the Company from the State in respect of guarantee shall be returned to the Government out of the net earnings exceeding 6 per cent. per annum on the sum of £ 5,000 per kilometre, until complete reimbursement.

" Article 17. Each Company shall deliver to the Government and the Bankers quarterly provisional accounts showing its earnings and expenses during each quarter (commencing with the quarter ending 31st March, 1892), within one month after the expiration of such quarter, and the Bankers shall deduct from the quarterly instalments payable, such amount or amounts as shall be shown by the accounts thus rendered to be in exceess of the amount required in respect of the guarantee. All such quarterly accounts and payments shall be provisional only, and shall be afterwards definitively adjusted on the completion of the audit of the definitive accounts for the whole year, as provided by the next Article.

" Article 18. The provisional quarterly accounts are only established for the purpose of not interrupting the payments at the fixed dates. Definitive accounts of the working of each railway up to the 31st of December in each year shall be delivered by the Railway Company to the Government within two months after the close of such year, and the audit of such accounts shall be proceeded with promptly. On completion of the audit the Company shall forthwith refund to the Bankers any amount shown thereby to have been paid to the Company in excess of the amount payable

in respect of guaranteed interest in terms of articles 15 and 16, or shall receive such further amount as it may be entitled to, as the case may be. No further payment shall be made to any Company until any amount due from it shall have been refunded, but no quarterly payment on account shall be withheld on the ground of the non-completion of the audit of the accounts by the Government auditors, the railway Company not being in default. Any question in difference arising on the audit shall be settled in manner provided by the Railway Concessions and Laws.

" Article 19. Except only as hereby varied the provisions of the Laws and Concessions relating to the said Railways remain in full force.

" Article 20. If, in consequence of the present arrangement or for the purpose of carrying the same into effect, it should be necessary or be deemed expedient for any of the said Railway Companies to go into liquidation, such Company and its Liquidators will have the right of transferring its Concession to a new Company which shall be recognised by the Government as entitled thereto, with all the rights and privileges of the old Company thereunder.

The ad referendum agreement of which the above articles form part was ratified by the financial agent of Uruguay in London in accordance with the law published on the 7th of October 1891 which authorized the Executive Power to arrange the External Debt and the Railway guarantees.

In their turn the companies, through their representatives ratified the agreement, which was therefore definitely concluded.

In accordance with the regimen determining the laws and decrees bearing on the subject, concessions have been granted for the construction, which will be carried ont, of all the lines forming the railway system of the Republic.

Later on we will give the technical features of each one of the trunk lines already constructed and open to service, as also of the Interior of Uruguay Railway, which. in this Republic, forms a section of the Inter-Oceanic line from Recife to Valparaiso)

Physical features of the Railways

OF THE ORIENTAL REPUBLIC OF URUGUAY.

CENTRAL URUGUAY RAILWAY.

LENGTH OF LINE 314 KIL: 600 MET:

	N.os	LENGTH KIL: MET:
GRADIENTS.		
Of 20. . . . . per 1000 .	2	0.796
Between 20 and 13.26 " "	52	22.176
" 13.26 and 10.00 " "	104	91.850
" 10.00 and 5.67 " "	100	46.043
" 6.67 and 5.00 " "	74	34.673
" 5.00 and 4.00 " "	25	9.886
" 4.00 and 3.30 " "	25	10.305
Of less than 3.30 and 1.00 " "	124	57.334
Total of gradient line	506	273.063
" " level do	—	41.537
Maximum gradient 20 per 1.000. . .		
do do, height of, 8.40 met.		
do do, length 4.30 "		
CURVES.		
From 200 met. to 500 met. radius. .	113	36.923
" 500 " " 800 " "	83	29.756
" 800 " " 1.000 " "	69	18.430
Over 1.000 met. radius	29	14.119
Total length of curved line.	294	99.228
" " " straight "	—	215.372
Shortest piece of straight line between two curves in an opposite direction.		50 met. (1)
Shortest piece of level line between two contiguous gradients		40 " (2)

(1) Such a piece of line exists at kil: 65.260 m.
(2) " " " " " " " " 69.510 m.

Central Uruguay Northern Extension Railway.

LENGTH OF LINE 293 KIL: 325 MET:

	N.os	LENGTH KIL: MET:
GRADIENTS.		
Between 16 and 13.26 per 1000.	66	39.950
" 13.26 and 10.00 " "	208	94.294
" 10.00 and 6.67 " "	82	27.605
" 6.67 and 5.00 " "	48	15.358
" 5.00 and 4.00 " "	30	10.627
" 4.00 and 3.30 " "	17	5.420
Of less than 3.30 per 1.00 " "	34	11.315
Total length of gradient line	485	204.569
" " " level "	—	88.756
Maximum gradient 16 per 1.000. . .		
" " height of, 29.60 met.		
" " length 18.50 "		
CURVES.		
From 200 met. to 500 met. radius.	76	30.775
" 500 " " 800 " " .	101	44.727
" 800 " " 1.000 " " .	53	20.236
Over 1.000 " radius.	46	18.713
Total length of curved line.	276	114.451
" " " straight	—	178.874

Shortest piece of straight line between two curves in opposite direction. . . . . 100 met.

Shortest piece of level line between two contiguous gradients. . . . . 100 "

North-Eastern Railway.

LENGTH OF LINE 206 KIL: 200 MET:

	N.os	LENGTH KIL: MET:
GRADIENTS.		
Between 16 and 13.26 per 1000.	11	7.550
" 13.26 and 10.00 " "	137	71.600
" 10.00 and 6.67 " "	39	16.570
" 6.67 and 5.00 " "	29	15.175
" 5.00 and 4.00 " "	16	7.025
" 4.00 and 3.30 " "	12	6.575
Of less than 3.30 and 1.000 " "	24	14.325
Total length of gradient line. . . .	268	138.820
" " " level "	—	67.380
Maximum gradient 16 per 1.000 . .		
" " height 16.90 met.		
" " length 1.050 "		
CURVES.		
From 200 to 500 met. radius . . .	55	20.860
" 500 " 800 " "	71	27.678
" 800 " 1.000 " "	65	20.592
Over 1.000 met. radius.	12	4.884
Total extent of curved line	203	74.014
" " " straight "	—	132.186
Shortest piece of straight line between two curves in opposite directions.		100 met.
Shortest piece of level line between two contiguous gradients.		100 "

Montevideo-Minas Railway.

LENGTH OF LINE 122 KIL: 615 MET:

	N.os	LENGTH KIL: MET:
GRADIENTS.		
Of 20 . . . . . per 1.000.	19	4.820
Between 20 to 13.26 " "	74	25.204
" 13.26 to 10.00 " "	43	11.920
" 10.00 to 6.67 " "	39	14.727
" 6.67 to 5.00 " "	19	5.955
" 5.00 to 4.00 " "	11	3.940
" 4.00 to 3.30 " "	7	3.580
Of less than 3.30 to 1.000 " "	39	22.720
Length of gradient line.	251	92.866
" " level "	—	29.749
Maximum gradient 24 per 1.000. . .		
" " height 5.80 met.		
" " length 2.40 "		
CURVES.		
Between 200 to 500 met. radius.	32	7.520
" 500 to 800 " "	22	7.292
" 800 to 1.000 " "	39	13.608
Over 1.000 met. radius	16	6.882
Total length of curved line	109	35.302
" " " straight "	—	87.313

Shortest length of straight line between two curves in opposite directions . . . . . 91.32 met.

Shortest length of level line between two contiguous gradients . . . . . 100 "

Midland Uruguay Railway.

LENGTH OF LINE: 317 KILOM: 775 MET:

	N.os	LENGTH KIL: MET:
GRADIENTS.		
Between 16 and 10 per 1.000 . . .	392	159.806
" 10 " 5 " " . . .	116	34.567
Of less than 5 " " . . .	75	27.860
Total length of gradient line	583	222.233
" " " level "	—	95.542
Maximum gradient 16 per 1.000. . .		
" " height 27.60 met.		
" " length 17.25 "		
CURVES.		
With radius of 300 met.	1	0.241.73
Between 400 and 800 " radius. .	70	26.879.71
" 800 " 1.000 " "	14	5.430.87
" 1.000 " 2.000 " "	110	29.543.10
Total length of curved line.	195	62 095.41
" " " straight "	—	255.679.59

Shortest piece of straight line between two curves in opposite directions . . . . . 100 met.
Shortest stretch of level line between two contiguous gradients . . . . . 100„

North-West of Uruguay Railway.

This line, from Salto to the Cuareim River, is 187 kil 800 met. long, but it only enjoys State guarantee for the part comprised between the Yacuy stream and Santa Rosa,

a length of 81 kil. 257 met., whose physical features are as follows:

LENGTH OF LINE 81 KIL: 257 MET:

	LENGTH KIL: MET:
GRADIENTS.	
Between 16.66 and 15 per 1.000. . . .	9.581
" 15 " 12 "	5.225
" 12 " 10 "	7.420
" 10 " 6.66 "	10.863
" 6.66 " 5 "	6.275
" 5 " 2.50 "	8.450
Of less than 2.50 " per "	13.007
Total length of gradient line.	60.821
" " " straight "	20.436
Maximum grade 16.66 per 1.000.	
" " height 16.07 met.	
" " length 9.50 "	
CURVES.	
With 600 met. radius	1.336
" 700 " "	0.677
" 800 " "	0.926
" 900 " "	10.241
" 1.000 " "	1.241
" 1.500 " "	0.803
" 2.000 " "	0.199
" 4.000 " "	0.083
Total length of curved line.	15.506
" " " straight "	65.751
Shortest stretch of straight line between two curves in opposite directions	100 met.
Shortest piece of level line between two contiguous gradients	100 "

Northern Uruguay Railway.

LENGTH OF LINE 114 KIL: 200 MET:

	N.os	LENGTH KIL: MET:
GRADIENTS.		
Between 15.384 and 10 per 1.000.	62	58.475
" 10 and 5 " "	27	14.700
Of less than 5 per 1.000.	29	19.300
Total length of gradient line	118	92.475
" " " level "	—	21.725
Maximum grade 15.384 per 1.000 . .		
" " height 40.23 met. .		
" " length 3.200 "		
CURVES.		
Between 500 and 800 met. radius.	48	20.076
" 800 and 1.000 " "	16	5.447
" 1.000 and 2.000 " "	13	3.701
" 2.000 and 5.000 " "	2	0.480
Total length of curved line.	79	29.704
" " " straight "	—	84.496
Shortest straight stretch between two curves in opposite directions.		100 met.
Shortest level stretch between two contiguous gradients.		100 "

The following figures refer to the physical features of the lines in the Republic of most international importance.

PLANIMETRICAL FEATURES.

RAILWAY.	Termini.	Shortest distance between termini.	Length of line between termini.	Increased distance taken by line compared with shortest distance.
Central Uruguay Railways and Northern Extension. . . .	Montevideo, Paso de los Toros to Rivera	424 kil'ers.	567 kil:	25.24 %
North-Eastern Railways. . .	Montevideo to San Ramón and Nico Pérez.	117 kil: 500 m.	149 kil: 788 m. (1)	27.48 %
Midland Uruguay Railways	Paso de los Toros Paysandú and Salto	250 kil:	317 kil: 775 m.	27.20 %
International Uruguay Railways	Colonia, Durazno, Cerro Chato and kil: 126, 2nd. section, to San Luis.	502 kil: 500 m.	617 kil: 722 m.	22.46 %

RAILWAY.	Percentage of straight line.	Percentage of curved line.
Central Uruguay and Northern Extension Railways	64.85	35.15
North-Eastern Uruguay Railway	69.31	30.69
Midland Uruguay Railway . .	79.00	21.00
Uruguay Internal Railway . .	75.49	24.51

ALTIMETRICAL FEATURES.

RAILWAY.	Percentage of gradient line.	Percentage of level line.
Central Uruguay and Northern Extension Railways.	78.73	21.27
North-Eastern Railway. . . .	67.30	32.70
Midland Uruguay Railway . .	69.93	30.07
Uruguay Internal Railway . .	62.34	37.66

(1) San Ramón and Nico Pérez are considered termini.

RAILWAYS.	GRADIENTS OF.	PER CENT.
		%
Central Uruguay and Northern Extension .	between 20 and 10 per 1.000	40.83
	" 10 " 5 " "	20.35
	" 5 " 0 " "	17.42
	level.	21.40
North-Eastern	between 16 and 10 per 1.000	38.39
	" 10 " 5 " "	15.39
	" 5 " 0 " "	13.54
	level.	32.70
Midland Uruguay . . .	between 16 and 10 per 1.000	50.29
	" 10 " 5 " "	10.87
	" 5 " 0 " "	8.77
	level.	30.07
Uruguay Interior . . .	between 16 and 10 per 1.000	30.85
	" 10 " 5 " "	11.15
	" 5 " 0 " "	20.34
	level.	37.66

RAILWAYS.	Curves on the level.	MINIMUM RADIUS 400 METERS. Curves on gradients of 0.01 to 11.99 %	12 to .6 %	Total % of curves on the line.
Central Uruguay and Northern Extension	10.04 %	11.95 %	16.89 %	38.88 %
North-East.	8.82	12.22	9.65	30.69
Midland Uruguay. .	5.51	5.68	9.80	21.00
Uruguay Interior . .	7.84	10.65	6.02	24.51

Cross sections of the Railways.

The cross sections adopted in the construction of the lines in the Republic are all of a similar type. Those shown on plate N.° 1 correspond to the Northern Extension of the Central Uruguay Railway and are in accordance with the prescriptions of the railway law of 27th August 1884 and the decree, amplifying it, of September 3rd of the same year.

Owing to the firm nature of the soil and subsoil, the road-bed of the railways in the Republic cannot be surpassed as regards solidity.

It is to be regretted that it is impossible to give a minute description of the geological features of the land through which each line runs: the absence of special information on the point would have rendered necessary a detailed local examination in each instance, a work of too great length to be undertaken in the very limited time allowed for the preparation of this report.

It is true that the hardness of the soil and subsoil necessitates more labor in the preparation of the road-bed, but this, on the other hand, is compensated for by the abundance of materials which are found almost at the Company's feet, lime, sand, granite ballast, and drinkable water existing in every direction.

Rock cuttings are avoided to a great extent by means of the borings practised in laying on the final line and by which the depth at which they are to be found is determined, and when fixing the gradients the cuttings are allowed to touch the rock as little as possible especially if it is of the nature of granite. Sometimes no remedy is

left but to have recourse to explosives, but in determining the permanent line, efforts are always made to limit as far as possible cutting in the rock.

At kilometer 412, the Northern Extension of the Central Uruguay Railway, at a height of 275 meters 90 cent.ers above the sea level, enters the mountain groups of Tambores and the Infiernillo, and from that point to Rivera (203 met. 80 cent.: above sea level) runs through the most broken part of the whole region traversed; the deep and unavoidable cuttings have been made mostly through cenozoic land, and in some places, through basaltic and trachytic rock such as it was necessary to perforate in making the tunnel at kilometer 470. In this district are to be found the steepest gradients on the whole line; but the track is so solid and well ballasted, and, like all the other sections under the charge of the Central Uruguay Railway, is kept in such perfect order, that trains weighing 250 tons (including the weight of the wagons) and drawn by a four weel coupled compound engine, run over gradients of 0.016 per metre at the maximum speedallowed, viz: 72 kilometers per hour.

Such marvellous speed can only be attained in countries like Uruguay, where the steep gradients are, in a manner, compensated for, and rapid transit over them is allowed by the solidity which the nature of the soil and the excellent construction materials to be found at every step, afford in the preparation of the road-bed.

It was with true foresight and a clear conception of the future importance of the Railways in the Republic that an article was included in the railway law fixing 1 met. 44 cent. as the gauge for all the lines.

This gauge is that shown in the cross sections on plate N.° 1, and the immense importance of the normal types adopted in the construction of the railways in the Republic

will be evident when, later on, we treat of the general rules which should govern the construction of the great international lines in America.

Buildings etc.

The Central Uruguay and other Railways in the Republic have refrained from spending large sums of money in luxurious station buildings, although they have made them commodious and of ample dimensions, and have provided them with sufficient deposit sheds of the size that the exigencies of the service require.

The material used in building the stations is the stone found in the neighbourhood, pudding stone (a silicate-aluminous-ferruginous mixture) being preferred on account of its possesing the required solidity, and of its existing in great abundance, especially in the Colorado district of the Department of Canelones.

In nearly all the stations the good-sheds, the roofs and walls of which are made of galvanized iron, have been built on foundations of solidly cemented stone. In this respect, the Railway Companies have proceeded with great judgement, having provided solid buildings with all the accommodation necessary, but without expending money unnecessarily.

Up to the present, the Central Uruguay Railway Company, which works a length of 938 kilometers of line, has not built its permanent Central Station, having thought it prudent to postpone its construction for a time, in view of the crisis through which the Country is passing. There is a temporary building with all neccesary commodities for

properly carrying on the service, and the permanent station has been designed and its most necessary and urgent parts erected, viz, the large deposit sheds.

It is calculated that £ 100.000 will be required for the construction of the new station, and the Company at present appears to prefer to use the interest of this large amount for other and more pressing needs.

The stations are of two classes, 2nd and 3rd, and types of them are shown on plates N.os 2 and 3. N.o 4 shows types of 2 meter culverts, both open and closed.

Among the most important erections of the Railways in the Republic are the iron bridges of the Central Uruguay Railway, as follows: Over the River Santa Lucía of 20 spans of 15 meters each and 4 spans of 24 meters; over the River San José with 8 spans of 15 meters each and 9 of 10; over the Yi with 41 spans of 15 meters 24 centers; over the Río Negro with 22 spans of 18 meters and 9 of 36 1/2 meters; and the tunnel at kilometer 470, 228 meters long. On the Midland Uruguay Railway there are the Salsipuedes bridge of 9 spans of 37 meters each; the River Queguay bridge of 2 spans of 59 meters and 5 of 20 and the River Dayman bridge of 3 spans of 20 meters and 39 of 10 meters. On the North-West Uruguay Railway there is the River Arapey bridge of 3 spans of 39 meters 60 centers each and 18 of 12 meters 80 centers.

Below will be found a list of the bridges, culverts etc, the kilometric distance of each one, and the height of the rails above sea level. The bridges are all of iron carried on pillars, of iron in some cases, and of masonry in others. On the Central Uruguay and Northern Extension lines the Santa Lucía, San José and Yí bridges are on iron columns, whilst the Rio Negro bridge is supported by masonry.

The predominating spans used are those of 5.10 and 15 meters (16'6", 33, and 50', respectively). Plates 5, 6 and 7 show the types of bridges with spans of these dimensions, and are those of the bridges built both on the Northern Extension of the Central Uruguay Railway and on the other lines where the same span is used.

The type of bridge over the River Santa Lucía having spans of 15 and 24 meters, is represented in detail in the plates N.os 8, 9 and in figures 1 and 2 of N.o 12.

The Río Negro bridge with spans of 8 and 36 1/2 meter is represented in detail in the plates N.os 13 y 14.

In plate N.o 11 are shown cross sections of the tunnel constructed at kil. 470 on the Northern Extension of the Central Uruguay Railway: its elevation and the section of hill through which it runs are shown in figures 3 and 4 of plate N.o 12.

Bearing in mind the importance of graphical language when treating of construction we have thought it preferable to accompany this report with the drawings referred to instead of giving a long written description.

The following statement gives the position and number corresponding to each of the constructions referred to.

Central Uruguay Railway.

	STATIONS.	DISTANCE IN KILOMETERS.		HEIGHT ABOVE SEA-LEVEL.
		Between Stations.	From Montevideo.	Met. Cent.
1	Central (Montevideo).	0.	0.	2.40
2	Bella Vista . . .	2.710	2.710	8.05
3	Yatay	1.700	4.410	7.65
4	Sayago.	3.640	8.050	44.50
5	Colón	2.880	10.930	44.26
6	Independencia. . .	4.760	15.690	49.35
7	Piedras.	3.960	19.650	68.90
8	Progreso	6.770	26.420	55.50
9	Juanicó	8.900	35.320	43.00
10	Canelones	7.220	42.540	28.90
11	Margat.	8.700	51.240	10.80
12	Santa Lucía . . .	7.350	58.590	10.77
13	25 de Agosto. . .	4.550	63.140	14.35
14	Kil: 77 (crossing sta'n)	14.060	77.200	55.10
15	Isla Mala	13.420	90.620	63.70
16	Kil: 101 (crossing sta'n	10.380	101.000	73.51
17	Florida.	7.260	108.260	67.00
18	La Cruz	22.550	130.810	127.20
19	Sarandí	27.790	158.600	148.20
20	Kil: 172 (crossing sta'n)	13.600	172.200	141.90
21	Goñi	13.200	185.400	127.05
22	Durazno	19.400	204.800	86.05
23	Yí	4.180	208.980	73.84
24	Villasboas. . . .	19.620	228.600	89.05
25	Molles	16.000	244.600	128.30
26	Río Negro. . . .	28.540	273.140	65.90
27	Kilom. 288 . . .	14.860	288.000	133.30
28	Cardoso	20.000	308.000	76.30
29	Achar	31.000	339.000	176.80
30	Pampa.	20.000	359.000	214.90
31	General Netto . .	27.000	386.000	246.82
32	Tambores	26.000	412.000	275.90

	STATIONS.	DISTANCE IN KILOMETERS. Between Stations.	From Montevideo.	HEIGHT ABOVE SEA-LEVEL. Met. Cent.
33	Valle Edén (Edén Valley).	11.000	423.000	171.30
34	Tacuarembó . . .	25.000	448.000	137.00
35	Bañado de Rocha .	19.000	467.000	180.26
36	Paso del Cerro . .	16.000	483.000	132.95
37	Paso Tranqueras .	40.000	523.000	156.82
38	Paso Ataques. . .	16.000	539.000	158.50
39	Rivera.	28.000	567.000	203.80

	BRIDGES.	N.° and length of spans.		DISTANCE Between bridges.	DISTANCE From Montevideo.	Height above sea-level.
1	Quita Calzones river	1	5 m.	4.305	4.365	7.45
2	Miguelete	.	23 m.	0.225	4.590	8.84
3	Las Piedras. . . .	1	15 m.	10.840	15.430	47.40
4	Valley	1	7 m.	2.560	17.990	55.60
5	Colorado. river . .	2	5 m.	5.628	23.618	36.90
6	Valley	1	5 m.	10.996	34.614	32.50
7	"	1	5 m.	2.090	36.704	29.20
8	"	2	5 m.	2.401	39.105	22.00
9	"	1	5 m.	1.513	40.618	19.71
10	Astorga river. . .	1	10 m.	7.677	48.295	10.76
11	Valley	1	5 m.	0.745	49.040	9.40
12	Mata-ojo river . .	2	24 m.	0.280	50.320	10.00
13	Valley	1	5 m.	0.774	51.094	9.70
14	"	1	5 m.	0.820	51.914	9.10
15	"	1	5 m.	3.912	55.826	12.24
16	"	1	5 m.	3.632	59.458	9.96
17	"	1	10 m.	1.916	61.374	10.70
18	Santa Lucía River	20 4	15 m. 24 m.	1.426	62.800	13.05
19	Valley	1	5 m.	1.838	84.038	45.70
20	"	1	10 m.	1.029	85.666	47.30
21	"	1	10 m.	2.603	88.370	43.70
22	Isla Mala river . .	2	10 m.	4.036	92.406	50.80

	BRIDGES.	N.° and length of spans.	DISTANCE		Height above sea-level.
			Between bridges.	From Montevideo.	
23	Valley	2 10 m.	2.188	94.594	60.80
24	"	2 5 m.	3.786	98.380	49.94
25	"	1 5 m.	0.270	98.650	48.30
26	"	2 10 m.	0.292	98.958	49.06
27	Pintado River. . .	19 9 m.	8.132	107.090	51.30
28	Valley	2 5 m.	57.758	164.848	126.70
29	"	1 5 m.	41.399	206.247	74.70
30	Yí River.	41 15 m. 24	2.128	208.375	74.06
31	Saradí do.	2 10 m.	2.475	210.850	77.84
32	Valley	1 10 m.	2.150	213.000	85.00
33	"	1 5 m.	1.700	214.700	89.40
34	"	2 10 m.	12.954	227.654	86.30
35	Villasboas River. .	3 15 m. 24	0.346	228.000	86.30
36	Santa Marta do . .	1 10 m.	4.213	232.215	95.30
37	" " " . .	2 5 m.	0.465	232.680	97.30
38	Valley.	1 5 m.	0.305	233.045	99.48
39	"	2 5 m.	16.755	249.800	112.30
40	Sarandi Valley . .	1 10 m.	10.368	260.668	90.30
41	" " . . .	1 10 m.	1.832	262.500	84.78
42	Valley	1 5 m.	0.300	262.800	84.44
43	"	1 5 m.	3.000	265.800	74.43
44	"	1 10 m.	1.800	267.600	68.98
45	"	1 10 m.	1.625	269 225	64.30
46	Río Negro River.	22 18 m. 9 36.50	3.100	272.325	62.90
47	Guayabos do . .	2 10 m.	21.575	293 900	89.90
48	Valley	2 5 m.	2.630	296.530	101.65
49	Tala River. . . .	3 10 m.	5.345	301.875	77.65
50	Stream	1 18 m.	5.025	306.900	74.80
51	Cardoso River . .	4 15 m.	0.075	306.975	74.80
52	" " . .	1 5 m.	1.425	308.400	76.90
53	Buey River. . . .	2 5 m. 80	1.550	309.950	78.50
54	Valley	2 5 m.	0.550	310.500	79.90
55	" "	2 5 m.	4.545	315.045	87.90
56	Rolon River . . .	2 5 m. 80	1.055	316.100	92.05
57	Valley	2 5 m.	27.005	343.105	171.30
58	" " . . .	1 10 m.	76.395	419.500	198.50

	BRIDGES.	N.° and length of spans.		DISTANCE		Height above sea-level.
				Between bridges.	From Montevideo.	
						Met cent.
59	Valley.	1	15 m.	2.240	421.740	180.90
60	" " . . .	1	15 m.	1.210	422.950	176.10
61	" " . . .	1	5 m.	1.150	424.100	169.00
62	" " . . .	1	5 m.	1.625	425.725	159.42
63	" " . . .	1	15 m.	1.475	427.200	154.80
64	" " . . .	1	15 m.	1.850	429.050	149.70
65	" " . . .	1	15 m.	1.175	430.225	147.00
66	" " . . .	1	5 m.	1.675	431.900	143.70
67	" " . . .	1	5 m.	1.025	432.925	141.50
68	" " . . .	1	10 m.	1.200	434.125	140.30
69	" " . . .	1	5 m.	1.450	435.575	139.30
70	" " . . .	1	5 m. 80	1.050	436 625	138.30
71	" " . . .	3	15 m.	1.375	438.	137.30
72	" " . . .	3	15 m.	2.575	441 425	136.90
73	" " . . .	1	5 m.	4.695	446.120	141.95
74	" " . . .	1	10 m.	3.092	449.212	134.
75	" " . . .	5	15 m.	0.988	450.200	131.30
76	Molles River . . .	1	10 m.	1.600	451.800	133.30
77	" " . . .	1	5 m.	1.375	453.175	136.30
78	River	1	5 m.	3.400	456.575	147.10
79	"	1	5 m. 80 c.	0.875	457.450	141.20
80	Tres Cruces. . . .	5	15 m.	1.950	459.400	136.30
81	Sauce	1	10 m.	1.750	461.150	136.70
82	" " . . .	1	5 m.	2.865	464.015	146.10
83	Bañado de Rocha river.	2	5 m.	4.595	468.610	179.30
84	Tunnel.	length 228 c.		1.490	470.100	197.50
85	River	1	10 m.	4.150	474.250	142.80
86	"	1	10 m.	0.300	474.550	142.30
87	Carpintería River .	3	15 m.	2.150	476.600	137.40
88	Madruga "	1	15 m.	7.225	483.825	131.45
99	Tranqueras "	1	15 m.	2.025	485.850	133.85
90	Las Cañitas "	3	15 m.	4.940	490.790	137.25
91	" "	1	15 m.	7.420	498.210	140.64
92	Laureles river. . .	4	15 m.	0.240	498.450	140.64
93	River	1	10 m.	7.050	499.500	139.50
94	"	1	7 m.	6.225	505.725	150.10
95	"	1	10 m.	3.725	509.450	143.10

	BRIDGES.	N.° and length of spans.		DISTANCES		Height above sea-level.
				Between bridges.	From Montevideo.	
96	River	3	15 m.	3.750	513.200	143.62
97	Tacuarembó Grande river.	10	10 m.)	0.450	513.650	143.30
98	" " . . .	7	15 m.)	7.950	521.600	147.92
99	Valley	3	5m.80c.	3.525	525.125	149.12
100	" " . . .	2	5 m.	2.500	527.625	150.30
101	" " . . .	2	5m.89c.	2.050	529.675	151.
102	" " . . .	1	4m.50c.	1.150	530.825	752.80
103	River	5	7 m.	5.728	536.653	158.12

CENTRAL LINE.

From Montevideo to Rivera, including the branches to San José and from Sayago to Treinta y Tres (Junction with Northeastern Railway).

TOTAL NUMBER OF CULVERTS.	Under 1 metre wide.	Between 1 and 2 met. wide.	Between 2 and 3 met. wide.	Over 3 meters wide.
755	567	128	57	3

Montevideo to Minas Railway

BUILDINGS, BRIDGES, AND CULVERTS.

	STATIONS.	KILOMETRIC. DISTANCES.		DISTANCE FROM CENTRAL STATION.	HEIGHT ABOVE SEA LEVEL.
		Between Stations.	TOTAL.		
1	Montevideo	0.	0.		2.74
2	Cordón.	1.150	1.150	1.150	10.61
3	Unión	5.130	6.280		55.08
4	Ituzaingó.	3.700	9.880		48.89
5	Piedras Blancas. .	1.620	11.500		53.03
6	Treinta y Tres (Junction with branch to Central)	2.440	13.940		49.37
7	Treinta y Tres (old station).	6.845	17.785	17.785	52.78
8	Toledo (Junction with line to Nico Pérez)	6.815	24.600		59.90
9	Suárez.	5.400	30.000		54.24
10	Pando	7.200	37.200		26.35
11	Olmos (Junction with Uruguay Great Eastern. .	3.500	40.700		18.90
12	Tapia	23.200	63.900		23.90
13	Migues.	14.100	78.000		63.40
14	Montes.	8.120	86.120		37.80
15	Solís.	18.230	104.350		73.90
16	Minas	20.944	125.294		119.40

	BRIDGES.	NUMBER OF SPANS.		KILOMETRIC DISTANCE.		Height above sea-level.
				Between bridges.	From Central Station.	
1	River Manga . . .	1	5 m. 80	20.785	20.785	31.26
2	" Toledo . . .	1	11 m.	2.580	23.365	35.82
3	Valley	1	9 m.	2.964	26.329	41.77
4	River Meireles . .	1	9 m.	2.326	28.655	37.59
5	Valley	1	5 m.	2.174	30.829	35.05
6	"	1	16 m.	4.335	35.164	54.44
7	"	1	10 m.	0.295	35.459	53.93
8	River Pando . . .	7	15 m.	3.946	39.405	9.40
9	Valley	1	5 m.	3.095	42.500	17.40
10	"	1	5 m.	2.800	45.300	27.36
11	"	1	5 m.	0.525	45 825	29.40
12	"	1	5 m.	1.805	47.630	33.40
13	"	3	5 m.	2.590	50.220	39.90
14	"	9	5 m.	11.425	61.645	27.85
15	"La Sonda" River.	2	10 m.	1.485	63.130	23.90
16	Valley	1	10 m.	3.095	66.225	14.60
17	River Solis Chico .	6	15 m.	0.550	66.775	24.85
18	Valley	1	5 m.	4.650	71.425	32.29
19	"	3	5 m.	1.695	73.120	36.40
20	"	4	5 m.	1.330	74.450	41.65
21	"	2	5 m.	1.250	75.700	49.00
22	"	2	5 m.	0.785	76.485	53.58
23	"	1	5 m.	0.940	77.425	64.40
24	"	3	5 m.	3.560	80.985	41.90
25	"	2	5 m.	4.340	85.325	39.60
26	"	3	5 m.	1.075	86.400	40.90
27	River Solis del Medio	10	15 m.	1.525	87.925	34.90
28	Valley	3	5 m.	4.750	92.675	50.82
29	"	1	5 m.	6.450	99.125	87.57
30	River Solis Grande.	6	15 m.	2.360	101.485	57.90
31	River Atahoma . .	2	10 m.	1.540	103.025	59.36
32	Valley	1	10 m.	4.800	107.825	90.57
33	"	1	5 m.	0.355	108.280	98.25
34	"	2	5 m.	5.195	113.475	115.40
35	"	1	10 m.	0.775	114.250	118.65
36	"	2	5 m.	0.550	114.800	121.40
37	River San Francisco.	7	15 m.	9.925	124.725	116.40

CULVERTS.

TOTAL NUMBER OF CULVERTS.	UNDER ONE METER WIDE	FROM 1 MET. TO 2 MET.	FROM 2 MET. TO 3 MET.	OVER 3 METERS.
142	70	40	32	0

North Eastern of Uruguay Railway.

(TOLEDO TO NICO PÉREZ).

	STATIONS.	KILOMETRIC DISTANCE.		HEIGHT ABOVE SEA-LEVEL.
		Between Stations.	From Central Station.	METERS.
1	Toledo.	24.600	24.600	59.90
2	Sauce	11.800	36.400	36.25
3	Santa Rosa. . . .	17.900	54.300	58.08
4	Cazot	8.900	63.200	71.78
5	San Ramón. . . .	18.800	82.000	44.80
6	Chamizo	5.000	87.000	67.45
7	Latorre	19.900	106.900	87.70
8	Reboledo.	25.800	132.700	175.70
9	Cerro Colorado . .	20.300	153.000	232.65
10	Mansavillagra. . .	29.000	182.000	187.10
11	Illescas.	21.450	203.450	250.80
12	Nico Pérez. . . .	27.550	231.000	272.65

	BRIDGES.	Number of Spans.	Meters.	KILOMETRIC DISTANCE. Between bridges.	From Central Station.	Height above sea level. Meters.
1	Valley	1	10.00	30.620	30.620	55.05
2	River Sauce	2	10.00	5.380	36.000	36.90
3	Valley	1	5.00	0.700	36.700	32.92
4	River Mata Siete	3	10.00	3.800	40.500	20.05
5	Valley	1	5.00	1.510	42.010	30.30
6	do	1	5.00	1.390	43.400	34.45
7	do	1	5.00	0.780	44.180	35.90
8	do	1	10.00	9.330	53.510	47.68
9	River Canelón Grande	1	10.00	5.590	59.100	54.54
10	Valley	1	10.00	4.700	63.800	58.24
11	do	1	5.00	2.900	66.700	63.99
12	River Yala	7	15.00	8.400	75.100	43.40
13	Valley	1	5.00	1.650	76.750	40.90
14	do	1	5.00	1.040	77.790	40.90
15	River Larrañaga	2	10.00	0 910	78. 700	41.60
16	River Sta. Lucía	20 3	15.00 24.00	4.300	83.000	44.20
17	River Sta. Lucía (old bed)	1	10.00	0.750	83.750	43.90
18	River Sta. Lucía (old bed)	1	10.00	0.470	84.280	43.90
19	River Sta. Lucía (old bed)	3	15.00	0.720	85 000	43.90
20	Valley	1	5.00	91.750	176.750	150.77
21	River Mansavillagra	10	15.00	0.750	177.500	148.40
22	Valley	1	5.00	12.820	190.320	236.55
23	do	1	10.00	0.760	191.080	249.20
24	do	1	10.00	37.930	229.010	256.10

CULVERTS.

TOTAL NUMBER OF CULVERTS.	LESS THAN ONE METER WIDE.	FROM 1 TO 2 METERS.	FROM 2 TO 3 METERS.	OVER 3 METERS.
330	303	9	18	0

Central Uruguay Railway.

Branch line from 25 de Agosto to San José.

	STATIONS.	KILOMETRIC DISTANCES.			Height above sea-level meters.
		Between stations.	From the junction	From Central station.	
1	25 de Agosto . . .	0	0.	63.140	14.35
2	Capurro	5.780	5.780		25.51
3	Rodriguez	8.885	14.665		46.44
4	San José.	17.695	32.360	95.500	39.40

	BRIDGES.	Number of spans.		Kilometric distances. From the junction 25 de Agosto	Kilometric distances. From Central.	Height above sea-level meters.
1	River of the Virgin.	6	10.00	1.760	64.900	13.05
2	" " " "	2	5.00	0.570	65.470	13.05
3	Valley.	1	5.00	1.770	67.240	16.80
4	River Paja. . . .	1	10.00	2.550	69.790	22.30
5	Valley.	1	5.00	3.680	73.470	34.80
6	River Cagancha . .	3	10 00	6.330	79.800	30.80
7	Valley	1	10.00	4.050	88.850	40.51
8	"	1	5.00	2.030	85.880	34.07
9	"	1	5.00	1.360	87.240	30.87
10	"	1	8.00	2.650	89.890	29.30
11	River San José .	8 9	15.00 10 00	3.210	93.100	29.30
12	Valley.	1	5.00	0.540	93.640	28.90

Branch from Sayago to Treinta y Tres.

	STATIONS.	KILOMETRIC DISTANCES			Height above sea-level. Meters.
		Between Stations.	From the Junction.	From Central Station.	
1	Sayago	0	0.	8.050	44.50
2	Peñarol Workshops	1.927	1.927		34.20
3	Treinta y Tres . .	6.000	7.927	15.977	49.37

	BRIDGE.	NUMBER OF SPANS.	KILOMETRIC DISTANCE FROM CENTRAL STATION.	HEIGHT ABOVE SEA-LEVEL. METERS.
1	River Miguelete. .	2 of 15 meters	11.679	18.00 m.

Midland Uruguay Railvvay.

	STATIONS.	KILOMETRIC DISTANCES.			Height above sea-level.
		Between stations.	From the junction.	From Central Station.	
0	Junction with Central Uruguay Railway.	0	0	263	70.36
1	Paso de los Toros.	2	2		83.37
2	Francia	39	41		119.37
3	Tres Arboles . . .	20	61		176.22
4	Merinos	20	81		169.30
5	Guayabos	37	118		65.
6	Algorta	17	135		118.18
7	Piedras Coloradas .	23	158		94.59
8	Romani	26	184		78.
9	Paysandú.	22	206		46.64
10	Queguay	31	237		39.27
11	Guaviyú . 5 . . .	24	261		29.48
12	Chapicuy.	23	284		39.50
13	Piñeyrúa.	17	301		61.83
14	Salto.	16	327	590 kilom.s	40.83

	BRIDGES.	Number of spans meters.	Kilometric distance from Paso de los Toros.	Height above sea level meters.
1	River Salsipuedes .	9 of 37 m.	33.700	77.57
2	" Guayabos .	3 " 15 m.	178.330	60.60
3	" " .	1 " 10 m.	125.	65.48
4	" Cuotiembre .	1 " 10 m.	209.	12.36
5	" San Fran'co.	2 " 37 m.	213.750	11.22
6	" Chingolo . .	2 " 10 m.	223.530	28.97
7	" Queguay . .	(2 " 50 m.) (5 " 20 m.)	230.650	20.07
8	Alfiarrobas Valley.	2 " 10 m.	235.400	21.37
9	" " .	2 " 10 m.	238.400	32.02
10	River Quebracho .	(2 " 15 m.) (2 " 10 m.)	248.575	37.02
11	" Guaviyú . .	(1 " 37 m.) (7 " 10 m.)	264.	33.13
12	" Chapicuy Grande. . .	(2 " 20 m.) (3 " 10 m.)	278.300	33.24
13	" Carpinchuri.	4 " 10 m.	282.700	27.00
14	" Chapicuy Chico . . .	3 " 10 m.	289.	29.87
15	" Ceibal G'de.	2 " 10 m.	297.660	37.21
16	" Dayman . .	(3 " 20 m.) (39 " 10 m.)	308.	18.39
17	Ceibalito Valley.	3 " 10 m.	315.875	23.47

(1) The total span of the bridges and culverts throughout the line is equal to 2630 lineal meters and in the construction of the various bridges 3804 tons of cast and wrought iron was employed.

North Western of Uruguay Railway.

	STATIONS.	KILOMETRIC DISTANCES. Between stations.	From Salto.
1	Salto	0.	0.
2	Las Viñas	15.200	15.200
3	San Antonio	6.240	21.440
4	Stapeví	10.300	31.740
5	Palomas	27.300	59.040
6	Arapey	15.700	74.740
7	Santa Ana	9.150	83.890
8	Isla Cabellos	28.470	112.360
9	Zanja Honda	35.540	147.900
10	Santa Rosa	25.250	173.150
11	Port Cuareim	5.650	178.800

BRIDGES.

River Arapey.	This bridge has a total length of 1155 feet being approached from the North by a viaduct of 18 spans of 42 ft 6 in each. It has three wrought iron spans of 130 ft each, supported on wrought iron columns of sixty feet high on concrete foundations.
Lake Arapey.	5 spans of 42 feet 6 in.
	1 do " 32 ft.
Jacuy.	6 do " 50 ft.
do new bridge	3 do " 42 ft. 6 in.

There are also on this line besides the above mentioned:

2 bridges of 191 feet 6 in long.

1	do	"	178	"	0	"
1	do	"	149	"	0	"
3	do	"	127	"	6	"
1	do	"	94	"	0	"
3	do	"	85	"	0	"
1	do	"	50	"	0	"
2	do	"	42	"	6	"
2	do	"	32	"	0	"
1	do	"	30	"	0	"
3	do	"	18	"	0	"

Uruguay Northern Railway.

	STATIONS.	KILOMETRIC DISTANCES.	
		Between Stations.	From Isla Cabellos.
1	Isla Cabellos	0.	0.
2	Sarandí	29.500	29.500
3	Artola.	18.500	48.000
4	Cuaró	6.000	54.000
5	Tres Cruces	25.300	79.300
6	Rivera Colony	14.700	94.000
7	San Eugenio	20 200	114.200

	BRIDGES. (1)	LENGTH IN METERS.	KILOMETRIC DISTANCES. Between Stations.	From Isla Cabellos.
1	River Sauce.	20.00	34.384	34.384
2	Boquerón Valley.	25.00	3.361	37.745
3	Rolón do	10.00	2.240	39.985
4	River Cuaró Grande . . .	300.00	10.415	50.400
5	Valley	10.00	0.530	50.930
6	do	5.00	0.120	51.050
7	do	10.00	6.940	57.990
8	River Cuaró Chico. . . .	80.00	0.730	58.720
9	do Pelado	60.00	6.762	65.482
10	Valley	25.00	10.842	76.324
11	River Tres Cruces	170.00	1.696	78.020
12	Valley	10.00	5.593	83.613
13	do	30.00	23.334	106.947

(1) The total span of the bridges and culverts on this line is equal to 958 lineal meters and in their construction 1486 tons of cast and wrought iron have been employed.

Workshops.

Central Uruguay: The workshops of the Central Uruguay Railway are situated at Peñarol, distant ten kilometers from the Central station, and cover about fifteen hectares of ground, on which area have been erected all the buildings in use, with room left for any future extensions when found necessary.

The present erections comprise:

(1) A central building accommodating the various offices.

(2) A large brick shed 80 meters long by 30 meter broad, with weaving shed type roof of galvanized

iron, the iron spans of which are supported by the walls, and cast iron pillars on solid foundations, used for the storage of the companys materials.

(3) An engine repairing shop 90 meters long by 40 meters broad, of similar construction to the storeshed, equipped with the most modern machinery for turning, for polishing steel, smithies, steam hammer, crucibles, etc., etc.

Two travelling cranes of 25 tons each, running overhead, traverse the full length of the shop, being moved by means of a cable, and with these powerful machines the engines that are taken in for repairs are lifted and carried from the general road by which they enter to the repairing quarters without delay, or interruption of the ordinary business. The general power is distributed with economical arrangement, the whole of the machinery being run by a 25 horse power engine.

(4) A general carpenters shop 48 meters long by 25 meters broad, in which a 30 horse-power engine works the different machinery for turning, circular and ripping saws of all sizes, adjustable planing machine, drills, and a special machine for the manufacture of urunday sleepers.

(5) A painters shop for the painting and varnishing of the rolling stock; the repairs of the tarpaulins; and the making of the cushions, beds and bedding for the passenger coaches etc.

(6) An engine round house capable of housing 32 engines and tenders; the centre being provided with a turntable 14 meters long, allowing any engine and tender to be turned.

(7) A well 80 feet deep for the supply of water which

is pumped by a pulsometer into a tank of 250 cubic meters capacity, solidly constructed and supported on cast iron columns more or less twenty meters high.

(8) Coal stages of a convenient height erected alongside the departure lines for the coaling of the engines.

(9) A number of houses inhabited by the five hundred and odd workmen employed in the shops.

(10) A store set apart for the oil and kerosene, situated at a convenient distance from the other buildings.

The capital invested in these shops and buildings in round numbers amounts to $ 500,000, and the value of the machinery, including all expenses of transport and instalation, may be fairly estimated at an additional like amount.

Midland Uruguay: The repairing and erection shops of this Company are erected in the grounds of the head-quarter station of the line at Paysandú, and they are equipped with all the most modern system of apparatus and machinery invented to perform any class of railway work.

North West Uruguay: The workshops are situated two kilometers distant from Salto station and are arranged with all the different power-machinery for the erection and repair of the rolling stock, or for executing any class of work that the Company may require.

Uruguay Northern: These shops are erected in the grounds of the San Eugenio station.

They are furnished with all classes of machinery for the general repair of the rolling stock, worked by a sixteen horse power engine.

Rolling Stock.

The Central Uruguay Company and allied Extension Companies to Rivera, Nico Pérez and Minas, representaing, as we have elsewhere shown, a total length of 938 kilometers opened to public traffic, jointly possess 63 locomotives, 80 passenger coaches and saloons, 44 luggage vans and 1140 wagons of different classes for animals and cargo.

The accompanying statements show in detail the classes of vehicles.

From the other Companies, the Midland, North West Uruguay, and Uruguay Northern, owing to the brief time at our disposal it has not been possible to obtain similar returns.

Central Uruguay Railway and allied Companies.

List of Rolling Stock.

SALOONS AND COACHES.

TYPE.	NUMBER.	NUMERATION.	CLASS.	MAKERS.	YEAR.	WEIGHT.	LUBRICATOR.	COMPANY.	REMARKS.
1*a*.	5	14, 16, 19, 20, 37	1.ª	Ashbury Cº.	1872	7.000 Ks.	N.º 2	C. U. Railway Company.	
1*b*.	2	35 y 36	"	" "	"	6.900 "	"	"	Converted into small saloons-1887.
1*c*.	7	21 a 24, 33, 34, 38	Mixed	" "	"	6.980 "	"	"	
1*d*.	2	11 y 12	1.ª	" "	"	8.450 "	"	"	Converted into sleeping coaches 1892.
1*e*.	12	13, 15, 18, 25 a 42, 41	2.ª	" "	"	6.900 "	"	"	
2*a*.	1	44	1.ª	C. U. Railway Company.	"	7.500 "	"	"	
2*b*.	1	49	2.ª	" "	"	6.400 "	"	"	
3*a*.	1	57	Mixed	" "	1887	16.400 "	1	"	
3*b*.	2	56 y 58	2.ª	" "	"	15.500 "	"	"	Converted from Mixed 1890.
4*a*.	2	1 y 2	1.ª	Gloucester Cº.	1889	20.000 "	"	C. U. Northern E. Railway Cº.	
"	2	3 y 4	"	" "	"	" "	"	" Eastern " "	
"	5	5 a 9	"	" "	"	" "	"	" Railway Company.	
4*b*.	3	73 a 75	Mixed	" "	1891	18.370 "	"	"	
"	1	76	"	" "	"	" "	"	C. U. Northern E. Railway Cº.	
"	1	77	"	" "	"	" "	"	" Eastern " "	
4*c*.	2	78 y 79	2.ª	" "	"	17.440 "	"	C. U. Northern E. Railway Cº.	
"	2	80 y 81	"	" "	"	" "	"	" Eastern " "	
"	6	82 a 87	"	" "	"	" "	"	" Railway Company.	
5	2	42 y 43	"	Brown Marshall.	1867	14.900 "		"	N.º 42 Converted from 1.st class 1890.
6*a*.	4	45 a 48	1.ª	Bristol Cº.	1881	9.800 "	2	"	
6*b*.	5	50 a 53, 55	2.ª	" "	"	9.500 "	"	"	N.º 52 and 55 Temporarily as 1.st cla 2.

7a.	2	59 y 60	1.ª	Harlan, Hollingworth.	1873	16,200	"		"	
7b.	2	61 y 62	"	" "	"	16,820	"	3	"	Converted into sleeping coaches 1890.
8a.	1	65	"	Lancaster C°.	1889	17,480	"	1	North Eastern of Uruguay Railway C°.	
8b.	3	66 a 68	Mixed	" "	"	16,710	"	"	"	
8c.	4	69 a 72	2.ª	" "	"	15,670	"	"	"	
	80	Total number of saloons and coaches.								

BRAKE VANS.

1	3	1 a 3	Small	C. U. Railway Company.	1881	6,000 Ks.		N.° 2	C. U. Railway Company.	
2	1	5	"	" "	1884	7,320	"	"	"	Pay train.
3	3	6 a 8	"	Ashbury C°.	1872	7,000	"	"	"	Converted into Post vans 1886-7.
4	5	9 a 13	"	" "	"	6,503	"	"	"	Converted into Post vans 1891.
5	2	14 y 15	"	" "	"	6,000	"	"	"	
6	4	16 a 25, 35 a 38	Large	Bristol C°.	1881	13,000	"	1	"	Converted from covered wagons 1886-9.
7	5	26 a 30	"	Birmingham C°.	1888	11,500	"	"	North Eastern of Uruguay Railway C°.	N.° 26 to 28 have postal compartments.
8	1	31 a 34	Medium	Oldbury C°.	1889	6,700	"	"	C. U. Northern E. Railway C°.	
9	1	39	Large	Harlan, Hollingworth.	1873	15,160	"	5	" Railway Company.	Inspection train.
"	1	40	"	" "	"	14,980	"	"	"	" "
10	5	41 a 45	Medium	Oldbury C°.	1889	7,000	"	1	C. U. Eastern E. Railway C°.	Converted from covered wagons 1890.
	34	Total of Brake Vans.								

WAGONS.

TYPE.	NUMBER.	NUMERATION	TARE.	LOAD.	TOTAL.	CLASS.	MAKERS.	YEAR.	LUBRICATOR.	COMPANY.
1*a*.	70	1 a 70	5,200	10,000	15,200	Stone.	Ashbury C°.	1890	N.° 1	C. U. Eastern E. Railway Company.
"	30	71 " 100	"	"	"	" "	" "	"	"	C. U. Railway Company.
1*b*.	8	1.001 " 1.008	3,620	7,000	10,620	Ballast.	Midland C°.	1867	3	"
"	20	1.009 " 1.028	4.020	"	11,020	"	Robt. Fauld.	"	6	"
"	29	1.029 " 1.037								
		1.039 " 1.058	3,950	"	10,950	"	Ashbury C°.	1872	2	"
"	8	1.059 " 1.066	4,250	"	11,250	"	" "	1874	"	"
1*c*.	25	1.067 " 1.091	5,400	10,000	15,400	"	Lancaster C°.	1883	1	"
1*d*.	25	1.092 " 1.116	4,850	"	14,850	"	Metropolitan C°.	1885	"	"
"	20	1.117 " 1.136	5,000	"	15,000	"	" "	1887	"	N. Eastern of U. R. C°.
"	60	1.137 " 1.196	4,900	"	14,900	"	Birmingham C°.	"	"	"
"	10	1.197 " 1.206	"	"	"	"	Metropolitan C°.	"	"	"
"	50	1.207 " 1.256	"	"	"	"	Gloucester C°.	1889	"	C. U. Railway Company.
"	50	1.257 " 1.306	"	"	"	"	" "	"	"	N. Eastern of U. R. C°.
"	100	1.307 " 1.406	"	"	"	"	" "	"	"	C. U. Northern E. Railway C°.
2	30	2.001 " 2.030	4,600	7,000	11,600	High-sided	Ashbury C°.	1872	2	C. U. Railway Company.
"	7	2.031 " 2.037	4,300	"	11,800	" "	" "	1874	"	"
3*a*.	9	3.001 " 3.009	3,700	6,500	10,200	Small flat wagons	" "	1872	"	"
"	15	3.010 " 3.024	3,650	"	10,150	" "	" "	"	"	"
3*b*.	8	3.025 " 3.032	3,150	5,000	8,150	" "	C. U. Railway Company	1882	"	"
4*a*.	15	4.001 " 4.003								
		4.005 " 4.016	4,800	6,500	11,300	Small covered do	Ashbury C°.	1872	"	"
"	7	4.017 " 4.023	5,000	"	11,500	" "	" "	1874	"	"
		4.024 " 4.026								
4*b*.	23	4.028 " 4.044	6,100	10,000	16,100	" "	Lancaster C°.	1883	1	"
		4.046 " 4.048								
4*c*.	25	4.049 " 4.073	4,500	"	14,500	" "	Birmingham C°.	1885	"	"
		4.074 " 4.075								
4*d*.	46	4.078 " 4.101	6,000	"	16,000	" "	" "	1889	"	"
		4.103 " 4.107								
		4.109 " 4.123								

4c.	8	4.124 a	4.131	6.000	10.000	16.000	Small Covered do.	Birmingham Cº.	1889	1	North E. of U. R. Cº.
4b.	45	4.132 "	4.176	6.000	"	16.000	"	Oldbury Cº.	1890	"	C. U. Northern E. R. Co.
5	4	5.001 "	5.004	5.000	5.000	10.000	Small Cattle do.	C. U. Railway Company	1883	3	C. U. Railway Company.
6b.	5	6.001 "	6.005	7.500	12.000	19.500	Large flat do.	American	1878		"
6a.	16	6.007 "	6.022	9.200	15.000	24.200	"	Gloucester Cº.	1879	1	"
6b.	18	6.023 "	6.040	8.900	16.000	24.900	"	C. U. Railway Company	1885	"	"
6c.	30	6.041 "	6.070	9.100	"	25.100	"	"	1889	"	"
6d.	30	6.071 "	6.100	8.600	"	24.600	"	Gloucester Cº.	"	"	"
6e.	25	6.101 "	6.125	9.150	18.000	27.150	"	Birmingham Cº.	1888	"	North E. of U. R. Cº
6f.	10	6.126 "	6.135	9.000	12.000	21.100	"	American	1878		"
6d.	50	6.136 "	6.185	9.400	16.000	25.400	"	Ashbury Cº.	1890	"	C. U. Northern E. R. Cº
6g.	31	6.186 "	6.219	9.000	15.000	24.000	"	Gilbert Manfg Cº.	"	4	C. U. Eastern E. R. Cº
"	16	6.220 "	6.235	"	"	"	"	" "	"	"	C. U. Northern E. R. Cº
7a.	2	7.001 "	7.002	12.000	"	27.000	Large Covered do.	Gloucester Cº.	1879	1	C. U. Railway Cº
7b.	6	7.007 "	7.012	14.000	"	26.000	"	Bristol Cº.	1881	"	"
7c.	3	7.013 "	7.020	10.400	18.000	28.400	"	Birmingham Cº.	1888	"	North Eastern of U. R. Cº
7d.	6	7.021 "	7.026	8.850	12.000	20.850	"	American	1878		"
8a.	26	8.001 "	8.026	10.600	15.000	25.600	Large Cattle do.	Gloucester Cº.	1879	"	C. U. Railway Company.
"	6	8.027 "	8.032	11.600	"	26.600	"	" "	"	"	"
8b.	12	8.033 "	8.044	12.700	"	27.700	"	Brown Marshall	1881	"	"
8c.	6	8.045 "	8.050	11.100	"	26.100	"	Bristol Cº.	"	"	"
8d.	40	8.051 "	8.090	11.300	16.000	27.300	"	Gloucester Cº.	1889	"	"
8e.	20	8.091 "	8.110	11.700	"	27.700	"	Birmingham Cº.	1888	"	North Eastern of U. R. Cº
8a.	10	8.111 "	8.120	11.850	"	27.850	"	Ashbury Cº.	1890	"	C. U. Eastern E. R. Cº
"	10	8.121 "	8.130	"	"	"	"	" "	"	"	C. U. Northern E. R. Cº
9a.	2	9.001 "	9.002	11.000	15.000	26.000	Large Sheep do.	C. U. Railway Company	1886	"	C. U. Railway Company.
9b.	1	9.003		12.500	16.000	28.500	"	Ashbury Cº.	1890	"	"
"	2	9.004 "	9.005	"	"	"	"	" "	"		C. U. Eastern E. R. Cº
"	2	9.006 "	9.007	"	"	"	"	" "	"		C. U. Northern E. R. Cº.

13.087.000 K.º Total load.

114 Total number of wagons.

Locomotives.

The following tabulated statements will demonstrate the technical conditions of construction of the various engines belonging to the Central Uruguay Railway, as also the maximum loads they are allowed to haul on the various grades of the line.

Special attention is called to the locomotives of class C, built in 1891, by Robert Stephenson & C.º of Newcastle on Tyne, of compound type four-wheel-coupled with four wheel bogie, and bogie tender. The engines of this class on the Central line, and on the extensions to Rivera, Nico Pérez and Minas, on rising grades that vary from 0.016 per meter are able to haul 250 tons gross weight, or with light trains can easily travel at the maximum velocity permitted of 72 kilometers (45 miles) per hour.

The engines of class H, eight-wheel-coupled, Bissel two wheel bogie, three axled tenders, built by Beyer Peacock & C.º of Manchester are also worthy of mention. These engines are able to haul 450 tons on the rising grades (0.016 p. m.) of the Central line, and travel at 40 kilometers per hour.

These engines may be compared with the eight-wheel-coupled engines sent by the Midland of France Railway to the Paris exhibition of 1889, able to haul trains of 130 tons up rising grades of 0.033 per meter at 20 kilometers per hour, or to the Woolf eight-wheel-coupled type of cargo engine sent to the same exhibition by the Northern of France Railway, hauling 470 tons at 31 kilometers per hour on rising grades of 0.0115 per meter.

The engines and general rolling stock employed in the

passenger and cargo service of the principal Company in the Country, as also of the Midland Uruguay C.°, are quite equal to that used by the principal European companies.

The Uruguayan Railways by reason of the general guage adopted of 1m.44, by the hardness and solidity of the permanent way which is well maintained, and by the class of rolling stock, is at any time in a position to serve perfectly well the international system, of which all the railways of the Republic are destined to form part, as will be seen further on in the chapter treating on the extension planned for them outside the national frontier.

Central Uruguay and

LIST OF

CLASS.	Nos.	MAKERS' Nos.	DESCRIPTION.	CYLINDERS. DIAMETER.	CYLINDERS. STROKE.	DIAMETER OF WHEELS.
				Ft. ins.	Ft. ins.	Ft. ins.
A	1	235	6 wheel coupled, saddle tank.	" " 11	1 " 6	3 " 6
"	2	300	" "	" " "	" " "	" " "
"	42	1045	" "	" " "	" " "	" " "
"	43	1148	" "	" " "	" " "	" " "
"	44	1149	" "	" " "	" " "	" " "
B	3	245	6 wheel coupled, 6 wheel tender.	1 " 4	1 " 10	4 " 6
"	4	251	" "	" " "	" " "	" " "
C	47	2705	4 wheel coupled, compound passenger, 4 wheel bogie, & bogie tender.	Ft ins & Ft ins 1 11 " 1 4	5 " 10	5 " 0
"	48	2706	" "	" " "	" " "	" " "
"	49	2707	" "	" " "	" " "	" " "
"	50	2738	" "	" " "	" " "	" " "
"	51	2709	" "	" " "	" " "	" " "
"	52	2710	" "	" " "	" " "	" " "
"	57	3295	" "	" " "	" " "	" " "
"	58	3296	" "	" " "	" " "	" " "
"	59	3297	" "	" " "	" " "	" " "
"	60	3298	" "	" " "	" " "	" " "
"	61	3299	" "	" " "	" " "	" " "
"	62	3300	" "	" " "	" " "	" " "
D1	6	1081	4 wheel coupled, 4 wheel bogie, 6 wheel tender.	Ft ins 1 " 2	1 " 8	5 " 7 1/2
"	7	1082	" "	" " "	" " "	" " "
D2	38	630	4 wheel coupled, 4 wheel bogie, bogie tender.	1 " 2	2 " 0	5 " 3
"	39		" "	" " "	" " "	" " "
"	40	629	" "	" " "	" " "	" " "
"	41		" "	" " "	" " "	" " "
E1	5	1919	6 wheel, 4 wheel coupled, 4 wheel tender.	1 " 3	1 " 8	5 " 0
E2	8	675	" "	1 " 2	1 " 10	4 " 6
"	9	673	" "	" " "	" " "	" " "
"	10	674	" "	" " "	" " "	" " "
"	11	677	" "	" " "	" " "	" " "
"	12	676	" "	" " "	" " "	" " "
"	13	685	" "	" " "	" " "	" " "
"	14	6/84	" "	" " "	" " "	" " "
F	17	1424	" "	" " "	" " "	" " "
"	18	1425	" "	" " "	" " "	" " "

Allied Railway Cos.

LOCOMOTIVES.

WEIGHT.												PROPRIETORS.	MAKERS.	DATE.
ENGINE.				TENDER.				TOTAL.						
Tons.	cwt.	qrs.	lbs.	Tons.	cwt.	qrs.	lbs.	Tons.	cwt.	qrs.	lbs.			
												C. U. Railway Co.	Manning, Wardle & Co.	1867
												"	"	1870
												North Eastern.	"	1888
												Northern Extension.	"	1869
												"	"	"
												C. U. Railway Co.	"	1868
												"	"	"
37	13	2	8	27	19	3	20	65	13	2	0	"	R. Stephenson & Co.	1891
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	Eastern Extension.	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	C. U. Railway Co.	Beyer Peacock & Co.	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
												"	R. Stephenson & Co.	1867
												"	"	1870
												"	Taunton Mfg. Co.	1873
												"	"	"
												"	"	"
												"	"	"
												"	Sharp, Stewart & Co.	1869
												North Eastern.	Vulcan Foundry Co.	1873
												C. U. Railway Co.	"	"
												"	"	"
												"	"	"
												"	"	"
												"	"	"
												"	"	"
												"	Beyer Peacock & Co.	1874
												"	"	"

CLASS.	Nos.	MAKERS' Nos.	DESCRIPTION.	CYLINDERS. DIAMETER. Ft.	CYLINDERS. DIAMETER. ins.	CYLINDERS. STROKE. Ft.	CYLINDERS. STROKE. ins.	DIAMETER OF WHEELS, Ft.	DIAMETER OF WHEELS, ins.
G1	19	2111	6 wheel coupled, 2 wheel "Bissel" bogie, 6 wheel tender.	1	41/2	2	0	4	6
"	20	2112	" "	"	"	"	"	"	"
"	21	2113	" "	"	"	"	"	"	"
"	25	2996	" "	"	"	"	"	"	"
"	26	2997	" "	"	"	"	"	"	"
"	28	3030	" "	"	"	"	"	"	"
"	29	3031	" "	"	"	"	"	"	"
"	30	3032	" "	"	"	"	"	"	"
"	34	2916	" "	"	"	"	"	"	"
"	35	2917	" "	"	"	"	"	"	"
"	36	2918	" "	"	"	"	"	"	"
"	37	2943	" "	"	"	"	"	"	"
G2	27	2998	6 wheel coupled, compound, 2 wheel "Bissel" bogie 6 wheel tender.	Ft ins. 2 1	Ft ins. & 1 5	"	"	"	"
"	31	3033	" "	"	"	"	"	"	"
"	32	3034	" "	"	"	"	"	"	"
"	33	3035	" "	"	"	"	"	"	"
G3	53	2701	6 wheel coupled, compound 2 wheel bogie, & bogie tender.	"	"	"	"	"	"
"	54	2702	" "	"	"	"	"	"	"
"	55	2703	" "	"	"	"	"	"	"
"	56	2704	" "	"	"	"	"	"	"
H	22	2512	8 wheel coupled, 2 wheel "Bissel" bogie, 6 wheel tender.	Ft. 1	ins. 6	2	0	3	10
"	23	2513	" "	"	"	"	"	"	"
"	24	2514	" "	"	"	"	"	"	"
Y	15	594	4 wheel coupled, 4 wheel bogie, & bogie tender.	1	0	2	0	4	6
"	16	592	" "	"	"	"	"	"	"
K	45	2711	6 wheel coupled, saddle tank.	1	2	1	8	4	0
"	46	2712	" "	"	"	"	"	"	"

WEIGHT.												PROPRIETORS.	MAKERS.	DATE.
ENGINE.				TENDER.				TOTAL.						
Tons.	cwt.	qrs.	lbs.	Tons.	cwt.	qrs.	lbs.	Tons.	cwt.	qrs.	lbs.			
												" " "	" "	1881
												" " "	" "	"
												* " "	" "	"
												" " "	" "	1888
												" " "	" "	"
												Northern Extension.	" "	1889
												" "	" "	"
												North Eastern	" "	1887
												" "	" "	"
												" "	" "	1888
												" "	" "	"
												C. U. Railway Co.	" "	1889
												Northern Extension	" "	"
												" "	" "	"
												" "	" "	"
38	16	6	4	27	19	3	20	66	16	2	24	Eastern Extension.	Stephenson & Co.	1891
"	"	"	"	"	"	"	"	"	"	"	"	" "	" "	"
"	"	"	"	"	"	"	"	"	"	"	"	" "	" "	"
"	"	"	"	"	"	"	"	"	"	"	"	" "	" "	"
41	"	"	25	25	"	"	66	66	"	"	"	C. C. Railway Co.	Beyer Peacock & Co.	1884
"	"	"	"	"	"	"	"	"	"	"	"	" "	" "	"
"	"	"	"	"	"	"	"	"	"	"	"	" "	" "	"
												North Eastern	Taunton Mfg. Co.	1873
												" "	" "	"
								30	7	0	16	C. U. Railway Co.	Stephenson & Co.	1891
								"	"	"	"	" "	" "	"

Central Uru

DESCRIPTIVE TABLE OF THE LOCOMOTIVES, GIVING THE MAXIMUM SPEED CLASS WITH THE DIFFE

		A.	B.	C.	D.	
				(Compound).		
Number of each class. .	...	**5**	**2**	**12**	**6**	
		1 and 2	3 and 4	47 and 52	6 and 7	38 to 41
Numeration of the engines of each class	...	42 to 44	...	57 to 62	...	...
Number of coupled wheels.	...	6	6	4	4	4
Diameter of do	inches.	40	54	60	67 1/2	63
" " cylinders . .	"	11	16	16 and 22	14	14
Stroke of pistons	"	18	22	22	20	24
Highest pressure allowed.	(pounds.)	120	120	170	120	120
Maximum speed allowed on inclines	milles.	...	30	45	40	40
Maximum load allowed including weight of wagons.	(tons.)	...	280	250	180	180
Number of cattle wagons plus 2 brakes and wagons for horses (without cutting).	...	...	12	10	8	8
Do. do. (cutting the train on steep inclines) . . .	...	...	15	13	9	9
Goods trains (without cutting) N.º of vehicles allowed.	...	...	28	23	18	18
Mixed trains (heavy) coaches and brakes . .	...	...	5	5	5	5
Do. do. do. wagons . . .	...	...	20	18	6	6
Do. do. (light) coaches and brakes	...	...	...	7	7	7
Do. do. do. wagons . . .	...	...	. .	10	3	3
Cattle wagons allowed with mixed trains. . .	...	...	8	7	3	3
Passenger trains only . .	...	...	According to time table special orders.			

guay Railway.

ALLOWED ON THE INCLINES AND THE MAXIMUM LOAD ALLOWED FOR EACH RENT CLASSES OF TRAINS.

E.		F.	G.		H.	I.	K.
			(Simple.)	(Compound)			
8		2	20		3	2	2
5	8 to 14	17 and 18	19 to 21 25 to 26 28 to 30 34 to 37	27 31 to 33 53 to 56	22 to 24	15 and 16	45 and 46
...	...	...			...	...	...
4	4	4	6	6	8	4	6
60	54	54	54	54	46	54	48
15	14	14	16 1/2	17 and 25	18	12	14
18	20	20	24	24	24	24	20
120	120	120	160	170	160	120	150
35	35	35	30	30	25	40	...
220	220	200	350	350	450	180	...
9	9	9	15	15	20	8	...
11	11	11	18	18	24	9	...
22	22	20	35	35	45	18	...
5	5	5	5	5	...	5	...
12	12	10	25	25	...	6	...
7	7	7	7	7	...	7	...
6	6	5	16	16	...	3	...
5	5	5	11	11	...	3	...
...	...	...	...	...	...	...	...

Traffic returns of the Railways.

Comparative statement of the Central Uruguay Railway including the branches to San José, Minas, Treinta y Tres, from 1874 to 1892 inclusive.

YEAR.	MILES OF LINE OPEN.	TRAIN MILES RUN.	GROSS RECEIPTS.	EXPENDITURE.	NET PROFITS.
*1874	127 1/2	—	353.666 00	270.419 00	82.247 00
1875	—	—	387.009 00	292.582 00	94.426 00
1876	—	—	431.778 00	280.885 00	150.893 00
1877	—	—	431.545 00	302.436 00	129.110 00
1878	—	—	456.276 00	293.279 00	162.896 00
1879	130	201.115	518.463 50	278.764 69	239.698 89
1880	—	220.734	572.347 92	307.928 83	264.418 98
1881	—	209.896	642.648 81	316.237 41	326.411 51
1882	—	224.375	666.311 28	347.970 87	320.340 41
1883	—	234.845	737.513 25	350.915 19	386.598 06
1884	—	244.835	798.981 91	392.368 51	406.613 40
1885	150	245.939	909.403 49	440.168 30	469.235 19
1886	—	228.735	786.916 95	424.499 95	362.417 00
1887	190	266.835	916.703 63	455.999 16	460.704 47
1888	—	288.708	1.041.679 77	485.072 88	556.606 89
1889	—	353.739	1.294.738 07	603.988 86	690.749 21
1890	266	478.131	1.831.929 27	910.832 25	921.097 02
1891	271	449.062	1.418.974 35	751.089 50	667.884 85
1892	271	434.927	1.149.476 05	627.828 42	521.647 63

* From June 3rd 1874 only.

Comparative results of working of the Central Uruguay Railway

AND THE EXTENSIONS TO MINAS, NICO PEREZ AND RIVERA.

	CENTRAL URUGUAY RAILWAY. (including the line to Minas).			NICO PEREZ. Extension.		NORTHERN (Rivera) Extension.	
	1889-90.	*1890-91.*	*1891-92.*	*1890-91.*	*1891-92.*	*1890-91.*	*1891-92.*
Number of passengers	651,988	557,778	462,114	17,380½	25,338	3,166	9,267
Receipts from passengers traffic	$ 570,125.50	$ 499,248.05	$ 397,531.13	$ 23,665.11	$ 51,443.69	$ 8,042.28	$ 27,145.69
Do. telegraph	" 11,823.48	" 10,037.74	" 7,589.81	" 458.22	" 1,275.66	" 308.58	" 1,053.47
Do. luggage and parcels	" 62,164.90	" 50,311.76	" 30,519.22	" 2,607.72	" 5,220.30	" 892.77	" 2,512.99
Sundry receipts	" 15,422.41	" 12,135.20	" 13,506.65	" ..	" ..	" ..	" 30.00
Quantity of wool	Tons 14,049	Tons 11,563	Tons 15,816	Tons 419	Tons 2,119	Tons 311	Tons 1,325
Do. hair	" 167	" 202	" 240	" 8½	" 51	" 8½	" 43
Do. hides and skins	" 6,969	" 4,210	" 5,138	" 165½	" 1,001	" 101	" 514
Do. bones	" 854	" 2,209	" 1,061	" 52	" 75	" ..	" 18
Do. grain	" 54,367	" 55,763	" 51,864	" 8,988½	" 15,494	" 187	" 1,086
Do. hay	" 19,168	" 18,290	" 18,476	" 1,892	" 2,864	" 20½	" 50
Do. flour	" 6,192	" 5,156	" 5,226	" 470½	" 949	" 157½	" 535
Do. limestone	" 61,417	" 36,252	" 14,585	" ..	" 436	" ..	" ..
Buildings materials	" 219,156	" 118,501	" 24,182	" 1,243½	" 1,326	" 472	" 814
Material, Midland Railway	" 1,385	" ..	" ..	" ..	" ..	" ..	" ..
" North & East Ext.	" 59,091	" 49,959	" 10,203	" 18,676	" 480	" 1,069	" 18,000
General goods	" 92,752	" 53,235	" 55,260	" 4,361	" 8,344	" 1,712½	" 5,057
Wire	" 3,897	" 3,275	" 4,311	" 616½	" 1,605	" 310	" 535
Posts	" 4,849	" 3,581	" 3,608	" ..	" ..	" ..	" 1,240
Company's materials	" 46,461	" 55,593	" 33,958	" 690½	" 1,631	" 242	" ..
Gross weight carried	" 620,767	" 418,089	" 245,990	" 37,583½	" 36,578	" 4,621	" 29,177
Receipts from goods traffic	$ 1,106,399.71	$ 794,973.96	$ 620,438.62	$ 44,499.39	$ 92,302.21	$ 13,998.21	$ 12,656.28
Do. from animal traffic	" 65,992.57	" 52,207.92	" 70,890.62	Included in goods	" 22,439.80	" 274.61	" 1,931.12
Number of animals	92,497	55,615	97,646	1,240	27,319	6,369	21,239
Do. dogs	2,958	2,917	2,539	243	345	30	93
Total gross receipts	$ 1,831,929 27	$ 1,448,974 35	$ 1,149,476 05	$ 71,280.11	$ 172,751.46	$ 23,506.48	$ 106,629.55
Working expenditure	" 910,832.25	751,089.50	627,828.42	" 41,397.33	" 103,650.98	" 20,625.76	" 63,377.73
Net profit	" 921,097.02	667,884.85	54,647.63	" 29,883.11	" 69,100.68	" 2,880.72	" 42,251.82
Train miles run	478,131	419,062	434,927	29,797	107,095	15,548	64,000
Carriage and wagon miles run	6,135,588	4,926,021	4,458,784	264,357	934,714	117,542	695,944
Receipts per train mile	$ 3.83	$ 3.16	$ 2.64	$ 2.39	$ 1.61	$ 1.51	$ 1.65
Working expenses do.	" 1.90	" 1.67	" 1.44	" 1.39	" 0.67	" 1.33	" 0.99
Net profit do.	" 1.93	" 1.49	" 1.20	" 1.00	" 0.64	" 0.18	" 0.66
Percentage of working expenses on receipts	49.72	52.93	54.62	58.12	60.00	77.40	60.00
Average number of passenger per day	1,786	1,528	1,266	61	69	14	25
Do. receipts per passenger	$ 0.87	$ 0.90	$ 0.86	$ 1.36	$ 2.03	$ 2.54	$ 2.99
Do. do. per ton of goods	" 1.78	" 1.80	" 2.52	" 1.18	" 2.52	" 3.03	" 2.49
Mile of line open	266	271	271	98	128	108	182
Average miles of line open	..	..	..	58	123	70	138

The Northern Extension was opened to public service throughout to Rivera on the 5th of February 1892: the Nico Perez Extension was opened throughout on 1st. September 1891, and the Minas line on 6th. February 1889.

Results of working of the Midland Uruguay Railway.

DETAILS.	1890.	1891.
Number of passengers.	12.674 1/2	14.649
Receipts from passenger traffic.	$ 31.423.94	$ 44.892.62
Do. telegraph	" 737.78	" 1.634.91
Do. luggage and parcels	" 3.259.52	" 3.779.91
Sundry receipts . . .	" 515.11	" 2.541.95
Gross weight carried.	Kil^ers. 9.990.812.00	Kil: 13.948.222.00
Receipts from goods traffic.	$ 27.099.94	$ 46.379.93
Number of animals. .	671	5.227
Do. dogs	114	127
Total gross receipts .	$ 63.036.29	$ 99.279.32
Working expenditure.	" 125.006.09	" 137.238.74
Train miles run . . .	60.161.08	70.506.40
Carriage and wagon miles run.	491.178.00	884.347.50
Receipts per train mile.	1.05	1.41
Expenses " " " .	2.08	1.95
Percentage of working expenses on receipts.	198.31 %	138.30 %
Kilometers of line open. (1).	—	317

(1) Until the 15th April 1890 only the first 80 1/2 kilometers, viz as far as Merinos stations, were open to public service: on that date the section from Merinos to Queguay (kil: 236) was opened.

The last section from Queguay to Salto (kil: 317.036) the junction with the Northwestern Railway, was handed over to public traffic on 1st November 1890.

Uruguay North Western Railway.

DETAILS.	1887.	1888.	1889.	1890.	1891.
Number of passengers	12.282	14.621	20.757	21.144 1/2	16.868
Receipts from passenger traffic	$ 34.057.15	$ 38.796	$ 47.826.80	$ 53.838.68	$ 40.499 85
Do. telegraph.	" 1.549.91	" 1.816.38	" 2.143.31	" 2.239.62	" 1.629.09
Do. lugagge and parcels	" 4.786.27	" 5.400.58	" 6.188.23	" 6.433·80	" 5.815.92
Sundry receipts	" 2.056.06	" 680.26	" 1.533.25	" 722.45	" 245.00
Quantity of wool and hair.	Kilos.807.495	1.653.352	1.509.552	1.004.450	1.359.711
Do. hides and bone	" 1.077.722	1.300.149	2.316.493	1.710.300	1.083.860
Do. grain and hay.	" 475.430	485.510	523.340	842.290	1.344.610
Do. of the Company's construction materials.	" 3.736.556	—	—	—	—
Do. general merchandise.	" 13.826.357	22.201.944	38.585.468	38 110.419	28.957.897
Total weight carried.	" 18.923.560	25.640.955	42.934.853	41.667.459	32.746.078
Receipts from goods traffic.	$ 63.729.92	$ 86.820.90	$ 132.111.98	$ 135.130.90	$ 96.066.06
Total gross receipts	" 106.179.91	" 113.514 12	" 189.803.57	" 198.365.45	" 144.252.92
Working expenditure in Salto and London.	" 120.866.96	" 145.701.47	" 184.714 89	" 185.298.77	" 139.866.22
Train miles run	64.307	89.686	94.731	103.951	94.061
Wagon and carriage miles run	710.137	823.793	884.301	973.419	802.339.
Receipts per train mile	$ 0.955.88	$ 1.201.96	$ 1.938.69	$ 1 908.25	$ 1.533 61
Expenses do.	" 1.088.00	" 1.311.17	" 1.886.71	" 1.791.88	" 1.486.97
Percentage of expenses on receipts	113.83	109.12	28	—	—
Average number of passengers per day.	33.64	40.06	56.87	57.93	46.21
Miles of line open	111.08	111.08	111.08	111.08	111.08

Results of working of the Uruguay Northern Railway.

DETAILS.		1891.
Number of passengers		3.353 1/2
Receipts from passenger traffic	$	8.526.80
Do. telegraph		392.37
Do. luggage and parcels		1.128.98
Sundry receipts		57.39
Total weight carried	Kilos	4.030.028
Receipts from goods traffic	$	11.490.56
Number of animals		315
Do. dogs		15
Total gross receipts	$	21.596.10
Working expenditure	"	55.672.65
Train miles run		21.496.47
Carriage and wagon miles run		146.766.71
Receipts per train mile	$	100.46
Working expenses per do	"	2.589.00
Percentage of expenses on receipts		157.7
Kilometers of line open. (1)		114.155

(1) The line was opened throughout to public service on April 17th 1891.

Control of Railways receiving State Guarantees.

By a decree dated January 26th 1892 the Regulations for the fiscal intervention in the guaranteed Railways were approved.

The duties of the Central office, as set forth in these Regulations, are as follows:

I. To intervene in all the technical branches of construction working and administration.

II. To intervene in all that may refer to the safety and regularity of the traffic, whether of passengers or of merchandise.

III. To intervene in the consumption of materials, the prices paid for them, their quality, their usefulness and the use made of them.

IV. To intervene in the book-keeping, with a right to reject all accounts not presented in the form laid down in article 9 paragraph B.

V. After consulting the Companies, to point out to the Superior Government any useful measures to be taken which would benefit the public, the State or the Companies themuselves.

VI. To take note of the agreements celebrated between the Companies with regard to the movement of trains.

Argentine Republic.

II.

THE RAILWAYS OF THE ARGENTINE REPUBLIC.

In considering the railways of the Argentine Republic opened to traffic, in construction, or projected, there are noticeable in the whole network four great systems that run out of Buenos Aires:

(1.) The Buenos Aires Great Southern Railway, with a total length of 1878 kilometers, the main line running to the port of Bahia Blanca, distant 717 kilometers, from whence at a future date it is intended te be continued across the Río Negro, Chubut and Santa Cruz territories.

(2.) The Buenos Aires and Pacific Railway to Valparaiso of 1221 kilometers to the Argentine-Chilian frontier, this line forming a section of the Interoceanic line from the port of Recife (Pernambuco) to the port of Valparaiso.

(3.) The Buenos Aires and Rosario Railway running to Tucumán, and from thence, in combination with the Central Northern Prolongation Railway, to Jujuy distant 1507 kilometers from the Capital.

The Central Northern Prolongation will be continued to the Bolivian frontier and will thus form a principal line in the combination proposed with the railways of that country.

(4.) The Santa Fé, Reconquista and Formosa route intended to communicate with Asunción (Paraguay), and of

the total length of 1216 kilometers to Formosa, there are already constructed some 779 kilometers as far as Reconquista.

These four lines by the districts which they traverse and the towns which they serve, form the great trunk lines of the Argentine railway system that connects with the Capital, and they belong:

(1.) To the Buenos Aires Great Southern Railway Company Limited.

(2.) In three sections:

(a.) Buenos Aires to Villa Mercedes to the Buenos Aires & Pacific Rly. Co. Ld.

(b.) Villa Mercedes to Mendoza to the Argentine Great Western Rly. Co. Ld.

(c.) Mendoza to the Chilian frontier, to The Transandine Railway Co. (1)

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(1) The magnitude of the works now being carried ont for the preparation of the road-bed of the Transandine Railway and which are the greatest undertaken up to the present in South America, destined as they are to throw open the arteries of rapid communication between this part of America and the European Continent, Australia and New Zealand, induces us to give a slight description of them, taking extracts from an article which appeared in the "Nacion" of Buenos Aires on the 4th of May of this year.

The Transandine Railway is of one meter gange and is divided into two sections: the Argentine Section, 175 Kilometers in length, belongs to an English Company formed in London by Messrs. John E. and Matthew Clark who are constructing the line, and the Chilian Section, 175 Kilometers long which is being built by the same firm of contractors. The two sections measure 350 Kilometers in length.

The length of all the tunnels, of which there are twenty, added togther is 16.290 meters, of these 2.500 meters are already perforated on the Argentine side and 834 meters on the chilian.

The most important tunnels are:

	length in meters
1. Las Señas	690
2. Navarro	756
3. Cuevas	850
4. Cumbre	5.085
5. Calavera	3.750
6. Portillo	1.885
7. Juncalillo	1.275
8. Juncal	1.104
Total	15.375 meters.

The four first are in Argentine territory.

The three first and three last are lateral galleries, i: e:, they run parallel to the riverbank at a few meters from the edges of the same and have been made as a protection to the track against snow and the inclemencies of the weather.

(3.) In two sections:

(a.) Buenos Aires to Tucumán, to the Buenos Aires and Rosario Railway Co. Ld

(b.) Tucumán to Jujuy, to the Nation.

(4.) In three sections of which the two constructed already belong:

(a.) From Buenos Aires to Santa Fé, to the Buenos Aires and Rosario Railway Co. Ld.

(b.) Santa Fé to Reconquista, to the Provincial Government of Santa Fé.

(c.) Reconquista to Tucumán, to a separate company that will be formed to construct this line.

The diversity of interests on some of the principal trunk lines, by sections of the same belonging to different Companies, might have the drawback of prejudicing the regularity of a through service in combination from

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On the Argentine Side there will be 5217 meters length of tunnel and 11,158 on the Chilian. The "Cumbre" tunnel will be 3200 meters above sea level, which will be the highest point to which the railway will attain.

As a result of new and lengthy surveys recently made by the engineer Buggalny, the length of the Cumbre tunnel will be reduced from 5065 to 2700. This, besides shortening the time required for boring, from five years to two and a half, will by the increased facilities for ventilation, lessen also the inconvenience caused by engine smoke, as well as notably reducing the cost of the work.

The work of boring the tunnels was carried on during the winters of 1890 and 1891 the snow offering no inconvenience: operations were commenced on December 5 to 1889 at the Argentine end of the Cumbre tunnel and were gradually extended to the others. In one year about 1920 meters were done in the Argentine section and 800 in the chilian, without counting the galleries of access and other works for increasing the points of attack. All these works were done by hand as up to the present no use has been made of the machinery, the installation of which was about to be concluded when the works were suspended in January 1891.

The Portillo tunnel, on the Chilian side, turns completely on itself, resembling a huge corskerew within the mountain. Its upper mouth is 135 meters above its lower and the horizontal distance between the two is 400 meters.

The section of the tunnel is 15 square meters in extent, and the greatest height of solid ground above them is 900 metres (in the Cumbre tunnel), so that the temperature inside does not exceed 30° (centigrade) which will be easily supportable by the workmen during construction and by the passengers passing through them in the trains.

The work was attacked from 26 different places, 13 in the Argentine Section and 13 in the Chilian, about 150 meters all together being bored per month.

To conclude the tunnels it will be necessary to excavate about 200,000 cubic meters more of rock.

The starting point of the line is at Mendoza and at kilometer 24500 is the first bridge; this merits attention on account of its length which is 120 meters in six spans of 20 meters each.

various causes, such as the different opinions of the managers charged with the direction of the line, and also by the want of uniformity in the types of the rolling stock employed, were it not that the common interest of all companies thus forming a trunk line compels them to avoid the former possibility.

The second case has however been experienced in the Argentine Republic in connection with the mutual exchange of traffic between two or more Companies, and means have been taken to avoid a recurrence of the difficulties mentioned in the National Public Works Board report, 1885 to 1888 (page 417), in which treating of the exchange of traffic between the Buenos Aires & Pacific, and Argentine Great Western Railways at Villa Mercedes, they report:

" The difference in the system of coupling, between

At kilometer 32 the track begins to wind towards the interior of the mountain ridge.

The first tunnel, called the Coleton is at kilometer 36: it is 123 meters long and has been cut through red granite.

At kil: 265.00 is the second bridge, crossing the Mendoza river: it is 45 meters long and 40 meters above water level.

At kil: 373.00 the line crosses to the South Side of the river by a third bridge 45 meters in length. This, like the preceding ones, is built of iron on stone masonry, there being three piers of the latter material.

At kil: 385.00 is the Cachenta station, which takes its name from the locality and is solidly built of stone and lime.

By the fourth bridge, the line crosses again, at kil: 387.50 to the North bank. This bridge is 45 meters long and is an elegant structure of iron on three piers of Stone masonry.

Two hundred and fifty meters further on, at kil: 39 is the second tunnel. 40 meters in length.

Between kilometers 41 and 42 the course of the river has been deviated: on account of this two of the large bridges projected by the engineer who commenced the works have not been required.

At Kilometer 48.600 is the fifth bridge on the line and the first steel one, by this bridge, which is of 75 meters span, the line passes over again to the South bank.

In kilometer 52 is the third tunnel of 40 meters long.

The sixth bridge and second of 75 meters span is in Kilometer 54 and the line crosses by the line it to the north bank of the river.

The fourth and fifth tunnels are in kilometer 55 1/2 and are respectively 21 and 40 meters long.

In kilometer 58 the line crosses to the south side of the river by the seventh bridge, the third of 75 m. span, and in kil: 62 it recrosses to the north side by the eighth bridge and fourth of 75 m. span. At this point the line enters the district called La Invernada (The Winter season).

Guido station is in kil: 62 and has an excellent supply of water for locomotive purposes.

Tunnel N° 6 of 88 meters is in kil: 70.300; and N° 7 of 90 meters is in kil: 71.

In kil: 72 the point called Black mountain is arrived at it being a gigantic monolith of dark stone, and here we again cross the river to the south side by the

" the wagons of this Company, and of the other Railways " which run over this Companys line in great numbers " loaded with merchandise for Mendoza and San Juan, " causes great difficulties.

" The wagons of other companies are mostly provided " with center hooks and coupling chains, as also with " side buffers, whereas the greater part of the Argentine " Great Western stock has only the center coupling " buffer with one link & is without side buffers.

" The difficulties and dangers thus presented for the " coupling up of both classes of stock are innumerable.

" Besides the difficulties experienced in coupling up " vehicles with different systems of couplings, even with " vehicles having this center coupling in common there " is the trouble of one buffer being higher than the " other perhaps, owing to the springs of the vehicle

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ninth bridge of 60 m. span, this being the only steel bridge of those obtained from the United States

From this point the railway runs for a distance of 70 kilometers along the southern bank until it arrives at the river Tupungato.

In kil: 77 is tunnel N° 8 of 27 meters length and a short distance beyond there was another tunnel that has since been made into an open cutting for greater security.

Uspallata station 1700 m. above sea level is in kil: 92 and is of similar solid stone construction to that of Cachenta.

Tunnels N° 9 & 10 known as the "Bermejito" are in kil: 114, where the line crosses the river at a height of 76 meters.

In kil: 121.2 at a height of 2087 meters above sea level is the Rio Blanco (White river) the terminus of the sections officially opened to public traffic in Argentine territory, although the rails were laid on April 23rd 1893 as far as kil: 135, Rio Colorado (Red river); from which point the earth-works have already been made, for over two years, for another six kilometers and now almost reach the stopping place of Las Vacas.

The bridges and tunnels that we have mentioned kilometer by kilometer hardly give any idea of the enormous work that has been required for the construction of that part of the line which is now finished.

We have not mentioned, because it would take up too much room, a considerable number of culverts, several of which by their size are entitled to rank as bridges; neither have we spoken of the large cuttings and embankments because it would make this article of undue length, but we might mention that in the excavations made in the rocks for this line hundreds of tons of powder and dynamite have been used.

On April 5th 1889, the anniversary of the victory of Maipú, the works in Santa Rosa de los Andes were inaugurated by President Balmaceda.

The works on the Chilian section are divided into from sections:

1*st*.	From	Santa Rosa	to	kil 13;
2*nd*.	"	kil 13	"	" 35;
3*rd*.	"	Rio Blanco	"	Juncal Kil 52;
4*th*.	"	Juncal	to	la Cumbre.

" being more or less worn. or, it may be owing to the " center-buffer being fixed in a different position, but in " either event the coupling of same by a single link is " very difficult, at times making it necessary to bend the " link before it is possible to do so. It will also be " seen that these defects in the vehicles may be the " cause of accidents through the higher buffer locking " with the other and probably in this manner occasion a " derailment ".

Actually the above Companies have abolished the dangers and difficulties mentioned, they having recently equipped their lines with adequate rolling stock to ensure a good traffic service, as is proved by the following comparative table of the increase of the rolling stock on the lines between Buenos Aires & Mendoza which has replaced the primitive stock mentioned in the report:

The line begins a short distance from the State Railway (with which it forms a junction) in Santa Rosa, 830 meters above sea level, and runs on the south bank of the River Aconcagua being completed and open to traffic as for as Salto del Soldado (The Soldier's leap) where it crosses the river in kil 26 by a bridge of 20 meters span.

In Salto del Soldado there is a series of tunnels the first of which is 240 meters long and on emerging from which the river is crossed by a 20 meter span bridge to at once run into another tunnel of 63 meters on the opposite side. latter on passing through others of 45 and 70 meters respectiveiy until arriving in kil 27.700 the actual point of the rails.

The earthworks have been finished as far as kil 31.300 and the masonry of the bridges is also well advanced in the latter part of the second settion, whilst in Los Andes Staton all the permanent way materials are deposited for the construction of the line as for as Juncal kil 52 including the iron bridgework.

In kil 137 of the Argentine section the rack railway on the Abt system commences with a centre rail on a gradient of 8 % for a distance of 1250 meters; it then runs level as for as kil 141 where the rack again is used for 750 meters.

In kil 161 the same method will be used for a distance of two kilometers, as also from kil 165,250 to kil 170. the entrance to the first tunnel, of La Cumbre at 3188 meters above sea level.

On the Chilian section the rack commences in kil: 45 500 and runs for 3500 meters.

In kil: 54,200 it runs in the Juncal tunnel for a distance of 1104 meters & also in the Juncalillo tunnel there is the Abt system for 1275 meters as far as kil: 158,600. Part of this tunnel between kil: 56 and 58 is in spiral form, rising 135 meters in a horizontal distance of 400 meters.

In kil: 58,600 the line is again level to allow of crossing & train shunting sidings, locomotive service and to double the traffic facilities.

After passing this siding the rack line on the Abt system continues as for as kil: 63.700 where it ends & the railway then runs with a rising gradient of 1 in 200 as for as kil: 64 where the descent commences.

In kil: 65 the frontier between Chili and Argentina is crossed.

RAILWAY.	ROLLING STOCK NUMBER OF VEHICLES.			
	1888.	*1889.*	*1890.*	*1891.*
Buenos Aires & Pacific . . .	830	1573	1809	1838
Argentine Great Western . .	781	1418	1602	1637

In addition to the above difficulties which may be easily abolished by the united action of the Companies, we may also point out others affecting the Argentine sections of the principal lines of international importance that have been brought about:

(1.) By the want of a well studied plan of the general Argentine railway system that would have conveniently divided the camp districts served between the various lines of general or local interest, and in accordance with which the concessions would have been granted that have authorized the construction of 29660 kilometers of line, of which 12990 are already, open to traffic.

(2.) By the want of uniformity of guage in the great trunk systems.

The first mentioned inconvenience has resulted in certain lines of equally important extension competing for the traffic of the same zone, as we have illustrated, amongst others, by the lines from San Cristobal and from Sunchales to Tucumán running parallel with each other for a distance of 536 kilometers, more or less only 24 kilometers apart, through the provinces of Santa Fé, Santiago del Estero and Tucumán. There is barely a population of 32 inhabitants to the square kilometer, in no way warranting the construction of two lines separated by such a small distance, without resulting in serious detriment to the interest of the Company that does not enjoy the State guarantee, as also for the public interest thus

threatened by the possibility of being called upon to pay the full amount of the guarantee owing to competition, actually taking place with the line from San Cristobal to Tucumán.

In time the disadvantages thus suffered in the above districts, served by two lines which have required the investment of enormous sums of money for their construction, will doubtless disappear with the growth of the industries and commerce in the rapid manner customary in the Argentine Republic.

The inconvenience caused by the second difficulty however affects the proposed through direct service in this country's territory.

Several of the principal lines in the North of the Republic are unable to establish a mutual trafic combination service with the Southern lines unless they tranship; as also the Eastern lines, which unless a mode of continuance with the other lines in the country is resolved upon, will be unable to establish a through service.

The guage of the railways in the Provinces of Corrientes and Entre Ríos differs from that adopted in the neighbouring territories of the province of Santa Fé and the Chaco,—and in these latter, as in all other parts of the Country (with the exception of the Province of Buenos Aires), they have alternately used the 1.676 meters and the 1 meter guages, with the result that in the great trunk systems of primary importance that should run from Buenos Aires to Chili. Bolivia and Paraguay there is a difference in the guage.

The mean guage between the rails of 1.435 meters, the same as that adopted in the construction of the lines in the provinces of Entre Ríos and Corrientes, in our opinion would have been the most convenient one for the rail ways of principal national importance.

With such a guage the line from Buenos Aires to Bolivia, passing through Tucumán and Jujuy, that will form a most important section in the general system of the direct through route of the American continent, would not have had to contend with difficulty of a change in the guage, and the necessary loss of time required in having to change from the 1,676 meter line to that of 1 meter.

The saving that would have been affected on the extension of 1155 kilometers from Buenos Aires to Tucumán by the construction of the permanent way and works 24 centimeters less than the actual width, would doubtless have covered the cost of the extra width in the extension of 652 kilometers to Bolivia, of which 352 kilometers are already constructed as for as Jujuy.

The guage of one meter in the latter region has not been compulsory owing to the natural difficulties encountered, which are more or less the same as those found on the section from Tucumán to Metan, which we see by the Report of the National Department of Public Works (pages 276 and 277) would have permitted without difficulty the adoption of the 1,435 m. guage.

The curves on the line are in the proportion of 21.75 % with minimum radii of 400 meters; 78.25 % of the railway being in straight lengths of which the longest is 23.196 meters.

They report a maximum slope, 2.200 meters long, of 18 per 1.000: and two maximum gradients, 1.500 and 4.600 meters long respectively, of 15 per 1.000.

The general average of the slopes being 9 per 1.000 and of the gradients 8 per 1.000.

With the above technical conditions counting on the solidity of the permanent way obtainable on rocky and

mountain lands; with a steel rail of the "Vignol" type 34 kilograms to the lineal meter; rolling stock of the American bogie system; and six wheel coupled with bogie engines of "Stephenson", bogie tender; on the section from Tucumán to Jujuy and to Bolivia express trains would be able to travel at a maximum speed of 70 kilometers per hour; whilst the heavy cargo trains with similar rolling stock hauled by eight wheel coupled engines of Beyer Peacock & C.º would be able to carry up to 450 tons.

In the United States on the lines between New York & Boston heavy cargo trains on gradients of 28 per 1000 travel at a speed of from 25 to 30 kilometers per hour (L & P page 38); the average speed of the passenger trains on the largest railways being from 65 to 70 kilometers per hour.

In Brazil on the Central line, with gradients of from 18 per 1000, and curves of as low as 180 meters the trains run at an average speed of 46 kilometers.

And in Uruguay where the greatest gradients on the lines of uniform type in exceptional instances are 16 per 1000, the average gradient being per 1000, with curves of 200 meters, the light passenger trains with the rolling stock and engines mentioned on pages 110 and 116 of this Report are able to travel at the maximum speed allowed of 72 kilometers per hour, the average actual speed of the trains being from 30 to 60 kilometers per hour.

With these experiences the Central Northern Railway (Tucumán to Jujuy) could have been constructed at first adopting the middle guage of 1.435 m., which also might have been made applicable to the Buenos Aires & Rosario Railway (from Buenos Aires to Tucumán), and would have thus adepted it better for the movement of the

international American traffic to which it is destined: — at the same time being more economical than the 1.676 meters guage.

Also retaining in the mountainous section to the Bolivian frontier the same gradient and planimetrical features as in the section to Metan, it will be seen that the line would not be in any worse conditions than similar lines constructed in other American countries under the same or worse technical conditions, it of course being assumed that the roadbed would be made with the stability and solidity necessary, the rails being of the weight and section necessary to allow of the trains travelling without risk at the velocity demanded for a quick national and internatienal service.

The same drawback of the difference in guage is noticed, and apparently with less cause, in the railway from Buenos Aires to Formosa, a system of great importance on account of the immense district it serves in the Argentine territory, and by its being ultimately intended to serve as a means of rapid transit with the Paraguayan Republic.

This line is divided into three long sections, each one belonging to a distinct Company. The first from Buenos Aires to Santa Fé, 481 1/2 kilometers open to traffic, has been constructed with a guage of 1.676 meters: the second section from Santa Fé to Reconquista, 318 kilometers also open to traffic, has a guage of 1 meter only, whilst the third section from Reconquista to Formosa, the concession for which was granted by Congress on October 5th 1887, will be made with the 1.676 meters guage.

The territories on the right hand of the River Paraná are distinguished by extensive plains; and the height

above the sea level of that district as also of the various stations of the Argentine Railway system have been furnished together with the kilometric distances by the National Railway Board.

This interesting and useful compilation that we include further on gives for each railway, the distance between every station, the distance of each from the commencement of the line, also the distance of the two extreme termini of each line from the Buenos Aires Central Station; also the height above sea level of each station is given, and it will be enough to notice the various heights of each station in relation to the plan of comparison adopted, in order to prove that in the sections of the line we are treating of, i. e:—from Buenos Aires and Rosario vía the Irigoyen branch to Santa Fé, as also in the line from Santa Fé to Reconquista the general average of gradients will not exceed 1.5 per 1000.

These same and also the planimetrical conditions of the section from Reconquista to Formosa are given in the report of the National department of Public Works (pages 13 & 14) as follows:

" The slopes and gradients are almost nil. This is " proved by the level of the section of 230 kilometers " (Reconquista to Formosa) in the total length of which " there is only a total difference of 20 meters or an " average of 9 centimeters per kilometer.

" In the second section (Resistencia to Formosa) the " gradients are still easier, there being only a difference " in level of 4 meters in 187 kilometers.

" There are altogether 87 curves of which 56 are found " on the first section and 31 on the second.

" The radius of these curves varies from 500 to 2.000 " meters, with the exception of two close to Bermejo that

" have only 300 meters each, but which may be somewhat
" modified.

" On the first section the length of the curved as
" compared with the straight line is 25 kilometers to
" 230 kilometers, or 10 % of curves to 90 % straight
" line.

" On the second section the curved line is of 6.600
" kilometers extent to 180.400 kilometers of straight line
" or 3 1/2 % to 96 1/2 % respectively. "

With such exceptionally favourable natural conditions permited by the geographical surroundings of the whole district from Buenos Aires to Formosa at first sight it is difficult to in any reasonable explanation to justify the division of the uniform 1.676 meters guage on the two extreme sections of a system of 318 kilometers from Santa Fé to Reconquista with only a guage of one meter.

But to dispel this idea of an apparent anomaly we should remark that originally the full extension was not planned out of the great Argentine railway that will thus connect Buenos Aires with Asunción (Paraguay), one, which we prove further on, will be the route of greatest advantage over the other Argentine lines running in the direction of Paraguay, and that will be able to serve as a means of rapid communication between the port of Buenos Aires and that country.

Separate concessions have been granted to distinct companies from time to time and these latter have constructed their sections as influenced by their interests for the time being; this cause explains the differences in guage in the system that we now consider as a through route to appreciate its united importance in the arrangement of the international rapid american service. On the

other hand the section from Santa Fé, to Reconquista as constructed is justified in adopting the narrow guage; it forms part of the railway system of the province of Santa Fé, which has in its entire length been constructed of the meter guage, originally with the idea of forming a system for local necessities, but which with the advance of projects is now called upon to form a link in one of the systems that will rank as of first importance.

When that time arrives, if the traffic requirements demand it, the Santa Fé and Reconquista line will no longer be a line of local interest but one of national importance and will change its actual conditions unless in the meantime engineering science has not discovered some more rapid method, as for instance the change of bogie (at present working successfully on North American lines), by which the same vehicles are transferred from broad to narrow guage and vice-versa.

The Chaco Austral Railway, which commerces at Port Barranqueros on the right bank of the River Paraná opposite the Capital of the province of Corrientes, and terminates in the junction with the Central Northern Railway in the neighbourhood of San José de Metan (Province of Salta); considered from the point of view that its important position gives it, in forming part of the great system serving the American international movement, although, by the guage of 1.676 meters on which it as been projected, facilitates traffic with the proposed line from Reconquista to Formosa, at the same time this difference of guage, from the lines forming its real extensions, such as the Corrientes and Entre Ríos provincial system constructed on the 1.435 meter guage, and the Central Northern Prolongation will cause delays in the combinations with these latter with which it

should form a connecting link in establishing through communication between the cities and ports of the right bank of the River Uruguay, and the countries of Bolivia and Perú.

This second and important connection of the Central Northern Railway confirms the advantages that would have accrued from the construction of that line, as also of the others of general interest in the Argentine republic of a uniform guage of 1.435 meters, the same as adopted in the provinces bordering the River Uruguay, and in Paraguay, and which is the one most recommended for railways of great extent.

As to the technical conditions of the Chaco Central line in common with the majority of the Argentine lines they are exceptionally easy:—there are long stretches of road as on the Buenos Aires and Pacific line (from Buenos Aires to Villa Mercedes) where there are only three gradients of less than two kilometers all told tha barely average 5 per 1.000; the general average of the gradients and slopes on that line, on the Buenos Aires and Rosario to Tucumán, and on the line to Formosa only being from 1 to 1.5 per 1000; with straight lengths of line extending 318 kilometers on the Pacific railway, and another of 485 kilometers on the proposed Chaco Austral line.

Although some of the lines of the Argentine system, destined in the future to fill a principal part in the international service of South America, actually have not the solidity of permanent way nor a heavy enough rail to allow of an express train service, nevertheless when the time comes to make that service it will be an easy matter to adequately equip them. It must be borne in mind, that in a new country like the Argentine Republic, that,

as an indispensable step for the opening up of its fertile lands, has had to carry the iron road into the prairies, it is not possible at the very beginning to lay down the railways with all the improvements of the age; it might even have been more convenient if instead of the construction of the railways of the Argentine network being made as good as they are, in the unpopulated districts they had been built on a more rudimentary plan, less costly, although at the same time so made as to admit of their improvement from time to time as the traffic necessities might require.

In this matter the new countries should adopt the american plan of railway construction and *lay down the greatest number of kilometers with the smallest capital possible.*

The improvement of the original construction is made as the traffic grows, and had they not adopted this plan, many of the great lines of North America, that now enjoy great prosperity, would never have been made at all, if they had waited to obtain the capital required to lay the line at first with all the costly works to put same in first class order.

Legal regime.

The construction of Railways in the Argentine Republic has been effected by means of concessions granted in each particular case, either by the National Congress or by the Provincial Legislatures, the Railways being denominated, in the one case, National, and in the other Provincial.

The National Government has granted concessions for lines, as follows:

(*a.*) those destined to place two or more Provinces in communication.

(*b.*) those destined to place the National capital in communication with one or more Provinces.

(*c.*) those destined to establish communication between any point of the National territory and one or more neigh bouring States.

(*d.*) those to be constructed by the Nation.

(*e.*) Prolongations of lines belonging to the Nation or whose concessions have been granted by the National Congress.

The Provincial Governments have granted concessions for lines:

(*a.*) Of local interest, i: e:, those which do not go ontside the Province, thus respecting the rights of existing concessions granted by the National Government.

With this state of things, there is no fixed legislation to which the concessions, whether national or provincial, have been made subject, and it is far from our intention to say anything against this want of uniformity; as the concessions represent a series of state favors, there is real convenience, specially in new countries, in keeping the matter constantly on the *tapis*, in order to restrict these favors and diminish monopolies.

It is not be wondered at, therefore, that there has been vacillation in this direction in the first steps in the Argentine Republic towards attracting capital for the construction of the railway lines intended to populate its rich territories and to create its industries and commerce, and that it was necessary to load the concessions with favors.

The first attempt is revealed in the law sanctioned by

Congress on the 30th June 1885 authorising the construction of the Railway from the city of Rosario to that of Córdoba, on the following bases:— a temporary concession for ninetynine years, at the end of which time the line would revert to the Government, on payment of its valuation price: a free grant in perpetuity of a zone of land twenty squares wide on each side of the line: exemption from duties on all the materials necessary for the construction and equipment of the line: the right to construct branches enjoying the same privileges as the main line, the concession for the former to lapse concurrently with that for the latter: The Executive Power to have the right to take as many shares as the Public Treasury may permit: the Company to have the right to fix its tariffs whilde the concession lasts, charging the State for services rendered a third less than the general tariff.

The results not being obtained that the National Congress expected, the zone of land to be granted was doubled by a decree dated 30th October 1857. These favors were not sufficient to attract foreign capital, and the Public Powers being anxions to encourage the construction of Railways in the country, a law was issued on 26th September 1861 granting a guarantee of seven per cent per annum during ten years on a capital which should not exceed a maximum to be settled beforehand, the concessionaires being obliged to make a deposit in cash or bonds as a guarantee for the fulfilment of the obligations undertaken and to submit their tariffs every year for the approval of the Executive Power.

The regulations of this law were altered by the one of September 5th 1862 which fixed as a maximum kilometric cost of railway ready for traffic the sum of L 6000

per mile, with an annual guarantee of seven per cent for a term of years, the State to be repaid such sums as it might have to disburse under this service with the net profit of the working over and above 7 %; the Government being authorized to intervene in the Company's operations for the purposes of the guarantee service, as also in the fixing of the tariffs when the net revenue of the line exceeded 12 % per annum; they also reserving the right to expropriate the railway at any time on payment of its cost with additional 20 % as indemnization. The company were also obliged to give a satisfactory money security to guarantee the the fulfilment of their contract, and it was established that all questions that might arise between the Company and the Government should be settled by arbitration.

The conditions established by this law were improved by the contract of March 19th 1863, approved by Law of the National Congress on May 23rd.

This fixed the cost of line at L 6400 per mile with an annual guarantee of 7 % for forty years; this guarantee to be covered by the State paying the difference between the amount of such interest and the net profits of the working when this might be less, or when greater, the amount over and above to be paid to the State as return of the sums paid by it, it being established that henceforth for the purposes of the guarantee accounts 45 % of the gross receipts would be admitted as working expenses.

The Executive Power were authorised to subscribe for fifteen thousand L 20 shares in the Company; to grant to the Company gratuitously the lands necessary for the installation of the line and its dependencies; and to transfer to the Company, on conditions that they populate same, one league of land on both sides of the line in its full

extension; to intervene in the arrangement of the tariffs when the line produces dividends of more than 15 % on the capital.

The Company were exempted from all import duties for forty years on the materials necessary for the construction and use of the railway, as also for the same period of exemption from any property tax or levy on the property ot the Company or its dependencies. They were granted the right of using the national woods and forests for the purposes of the line or the traffic,—free of charge. The employees engaged ou the construction or in the working of the line were exempted from military service; and similar privileges to those granted or to be granted to immigrants would be extended to those introduced by the Company.

The gratuitous transport of the public mails was made obligatory; the carriage of troops and war material to be effected at half the ordinary rates; and finally all questions between the Company and the Government were to be settled by arbitration. Such were the conditions of the law of May 23rd 1863 under which the construction of the Central Argentine Railway was made with a guage of 1.676 meters running from the city of Rosario of Sta. Fé to Córdoba.

It will be seen that the first steps taken for the construction of National railways were made with all the prudence that the question demanded. This was however varied until the original plan was so changed to attract foreign capital that the concessions on the part of the State were increased, until at last the concessions were granted in perpetuity with a guaranteed interest for forty years on a mileage cost fixed beforehand in addition to the other concessions we have mentioned:

With this line it may be said the maximum of State concessions were enjoyed for the fomentation of Railways, as later on the subsequent concessions were somewhat modified in their principal clauses.

Thus for instance although in the majority of concessions authorized in later years, the perpetuity of concession as granted to the Central Argentine with a guarantee of 7 % for forty years and other favours was also given, still to the East Argentine Railway there was no grant of lands, but the cost of construction was fixed at L 10.000 per mile by the law of October 3rd 1863 and Decree of July 26th 1870.

The law of 10 th October 1879 and the decree of 14 th October 1872 (concession of the Buenos Aires and Campana Railway) under the same type of concession, except that there was no land grant, reduced to 20 years the period during which guarantee would be enjoyed and which guarantee would be adjusted to the true cost of the road.

The National Congress, within the general terms of the regime of the concession of the Central Argentine Railway, made uniform the conditions which should govern the construction of five important lines, viz:, from Buenos Aires to Mendoza and San Juan; from San Juan to Totoralejos: from Tucuman to Jujuy; from Mercedes to Corrientes and the Transandine to Chile, and issued the law which was published on 5th November 1872 authorizing the Executive Power to contract, after calling for tenders, for those railways under the following conditions:

(*a.*) guaranteed interest at the rate of seven per cent per annum on the net cost of the line.

(*b.*) to pay the guarantee in cash or in public bonds bearing 6 per cent interest and one por cent amortizacion.

(*c.*) the cost of worxing to be fixed at 50 or 55 per cent of the gross receipts, according to the expense of traction rendered necessary by the nature of the road.

(*d.*) to repay the amount paid as guarantee in public funds or cash with the excess over 7 per cent net profit. if any.

(*e.*) The Executive Power to have the right to fix the tariffs while the guarantee lasts, and to intervene in them afterwards, should the line give more than twelve per cent.

(*f.*) a money deposit of one hundred thousand hard dollars on signing the contract, as a guarantee for the completion of the work.

(*g.*) The Executive Power to have the right to inspect the works.

This base has been made applicable to almost all the concessions for guaranteed railways since granted, with variations in the terms: the rate of interest guaranteed has been reduced to five per cent in the majority of the concessions, and the price per kilometer has oscillated between $ 18.000 and $ 31.000 gold.

Perpetuity, which was tacitly understood in all the above sections, has. in some guaranteed lines, been substituted by a temporary concession, limited to sixty years in the case of the line from Villa Maria to Rioja, and to fifty five years in the line from San Cristobal to Colon. (Laws of 15th and 21st October 1887.)

From the year 1887 onwards concessions have been granted in perpetuity without guarantee or premium of any kind, and temporary concessions for the tern of ninety nine years.

We will now give the principal terns of the regimes affecting the Argentine Railways.

I. (*a.*) Concession in perpetuity.
(*b.*) a guaranteed interest for periods varying from ten to forty years, paid in cash or public funds.
(*c.*) capital determined by a price per kilometer, varying between $ 18.000 and $ 31.500 gold.
(*d.*) the passing of from 45 to 60 per cent of the gross receipts as the cost of working for arriving at the guarantee.
(*e.*) repayment of the guarantee with the excess over seven per cent of the net taking of the line.
(*f.*) the right of the Executive Power to fix the tariffs while the guarantee lasts and to intervene in them afterwards, should the net earnings exceed twelve per cent.
(*g.*) monetary deposit on signing the contract as a guarantee for the completion of the works.
(*h.*) exemption from duties on the materials necessary for the construction or working of the railways.
(*i.*) exemption from all national or provincial taxes on the properties, fixed or movable, constituting the railways.

II. (*a.*) Concession in perpetuity without guaranteed interest or premium of any kind.
(*b.*) exemption from duties as is customary in concessions, stipulated by articles 54 and 55 of the Railway law of 18th September 1872,

III. (*a.*) Temporary concession for a term of from fifty five to sixty years:
(*b.*) a guarantee of five per cent for the whole term of the concession.
(*c.*) The return of the line and all its equipment to

the State at the end of the concession, without any compensation whatever.

IV. Temporary concession for the term of ninety nine years, at the end of which the line would revert to the State: without guaranteed interest.

(*b.*) as in regime N.º 3, the usual favors granted in the law of the 18th of September 1872.

The provincial governments have granted railway concessions in general, under the same bases as the national lines.

Preparation of projects.

The programme observed in proposing projects of public works has been based on that ruling in France for the body of Engineers of Bridges and Abutments, the adoption of which was counselled by the National Department of Public Works and decreed by the Minister of the Interior on July 27th 1876. It is as follows:

PROGRAMME TO BE FOLLOWED IN THE PREPARATION PROJECTS.

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		Advance proposals.
1st Extracts of letters. 2nd. General plan.	It is optional according to circumstances to adopt one of the following: 1 in 1000; in 2000; 1 in 2500; 1 in 5000; or in 10000. When possible the topographical plan should be used.	1st: In the general plan should be indicated the formation of the ground by means of horizontal curves, shaded or coloured, annoting also as many levels above the sea as can be obtained, especially those referring

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		to the summits and river high-water marks. Whenever the plan of the scheme is near the littoral the hydrographical charts should be used to indicate the coast line, and the heights of same should be noted. 2nd: On all maps and general plans due East must be shown. 3rd: The land plan must agree with the longitudinal seccion, and should have marked upon in with the greatest exactness possible the principal points on the section, also the kilometric distances, the heights and radius of the curves the changes of grade, and the works to be constructed. When it may be convenient, to examine the project more easily, the longitudinal section will be shown on the plan. 4th: When the tracing is shown crossing a valley exposed to floods, the high water limit must be indicated. If it is treating of a project to improve a water course or of a river defence-work the extreme limit to which the water reaches in each case must be determined and the direction of the current marked by arrows. The plan should also embrace the waters above and below the point of the proposed work so as to give an exact idea of the general direction of the water course. 5th: When dealing with the direction of a canal, public highroad,

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		or railway. the general plan should show both sides of the line, and for a distance of not less than a kilometers, a sufficient number of levels to prove the convenienceie of the proposed direction. The cross roads, limits of the properties, bases of the hill ranges, the river high-water mark, or the bank of the water-course, will give the most convenient cross sections in connection with which the levels should be taken 6th: When treating of the situation of a bridge the general course of the stream for a sufficiently extensive stretch should be shown, giving the waters above and below the point chosen for at least a kilometer on either side of it. The notes of sufficient levels should be made to give an exact idea of the longitudinal section of the bed of the water-course; and a certain number of cross sections to be able to judge of the convenience of the chosen sport. 7th: The point of reference in the taking of levels will be that of sea-level, also whenever possible the reference to the mean level of the River Plate at low water must be given.
3.rd Longitudinal section. Scale of section. ditto of heights.	Scale of general plan. Decuple of the plan scale.	8th: The annotations of the distances as also of the heights must be written in lines below the section, parallel with the edge of the plan. In each note of level must be given the accumulated distance from starting point:the kilometric distances,

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		annotations on the levels of the of the district with reference to the plan of comparation. When dealing with high roads or railways there must be given the levels of the proposed, and the distances of the direct outlines, points of tangent with their length, radius and direction of the curves, length of slopes or gradients with horizontals of same, mentioning the latter numerically. In each proposal should be shown on a line drawn above the general outline, the distance traversed in each Province. 9th: The extensión of the line must be divided into kilometers. the point of starting being marked with a cypher, and the extent of each kilometer noted with the letter K, followed by the corresponding number in figures. Each of these divisions will be again divided into equal fractions of a kilometer also to be noted in figures somewhat smaller than those used to mark the kilometers. 10. The levels or notes of the sections must be taken from 50 to meters apart when crossing a district that is not broken up, or in the latter case they will be taken as near each other as possible, it being generally arranged to have the distances between the levelling of equal lengths. 11. The section of the profile must be shown by a black line. The outline proposed must be drawn in

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		carmine. The surface of the earthworks must also be in carmine, and of the neighbouring land in yellow. The levels of the earthworks and surrounding ground will be noted in carmine, the former being written above the outline of same on the plan, and the latter below.
4th. Cross sections.	1 in 200 for heights and distances.	12. The cross sections must show an extension of at least double the width of ground they occupy. The level of the longitudinal section must be distinguished from the others by the use of special or distinct figures.
5th. Types of constructions & erections. Dimensions not exceeding 100 meters.	1 in 100	The levels of both the cross and longitudinal sections must be made on the same scale for comparison.
For dimensions that exceed 100 meters.	1 in 200	In order not to have the plans of two great length these sections may be shown on a plan showing a greater distance either above or below the point of reference but the annotations must be stated as so made.
Written documents:		In the cross sections of lands exposed to floods, or in the neighbourhood of a watercourse, the high water mark should be shown by a blue line and the corresponding level marked on the plan.
1st, Explanatory report		When the proposals refer to any work or improvement of a water course, a sufficient number of cross sections should be given to show the high water mark, and these should be taken outside the limits of the land exposed to inundation.
2nd. Statement showing approximate movement of earth, constructed works, etc.		These cross sections must always be shown on the same side, taking
3rd. Approximat estimate in detail of expenses		
4th Estimate of the yearly probable movement, when dealing with high roads.		

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		the direction of this towards the starting point.
		13. The greatest care should be observed in giving the levels, letting them be distinct and exact.
		The level of high and low water, sea level, etc should be marked by means of blue outlines and levels, in connection with the general plan.
		Definite Propossols.
1st. General plan.	According to circumstances one of the following scales must be adopted	14. The plans mus have all the details specified in articles 1, 2, 3 and 4.
	1 in 1000, 1 in 2000, 1 in 2500, 1 in 5000 or 1 10000.	15. The longitudinal section must have the details specified in articles 6, 7, 8, 9 and 10, in addition giving details of any excavations that it may be necessary to make in cuttings, or for foundations of buildings, these being shown on the section.
	Whenever possible a topographical plan should be used.	
2nd. Longitudinal section of distances and heights.		16. A plan of the excavations with all necessary details having reference to the general plan must be accompanied.
3rd. Excavations.	1 in 200	17. In addition to the details specified in article 12 the type of section of the high road, canal, or railway projeeted must be shown.
4th. Cross sections	4 in 200	18. In the drawings of the sections of the fundations of all buildings should be shown, by shading or coloured inks, the nature and thickness of the strata of earth in which the foundations have to be sunk. The
5th. Buildings	1 in 50	nature and thickness of each strata should be marked on same.
When the dimensions donot exceed 25 meters.		19. By means of blue lines and levels must be shown in the

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
When between 25 and 100	1 in 200	elevations and sections of earth works the high and low water level both of floods and otherwise.
Over 100	From 1 in 10 to 1 in 5.	20. On the plans of section and elevations must be shown the necessary levels to be able to establish the correctness of the proposal, and verify its importance.
For the details of buildings and for iron and wood railway material etc.	Always usine simple decimal scales.	21. In addition to the details that should accompany the plans as set forth in the previous articles the Board of Public Works are authorised to amplify same giving in each case the conditions and instructions necessary.
1st. Descriptive report.		22. All the documents forming a proposal must have a progressive number.
2nd. List of conditions.		23. The plan and longitudinal section will be drawn according to the course of the road, the progressive numeration running from the most important point on the shore to the Interior.
3rd. Detailed statement of the cubic movement of earth.		
4th. Statements of outlines, heights, slopes, gradients, horizontals, radii of curves, etc.		24. To facilitate the determination on a map of the point in which a work is to be executed, there should be indicated in the beginning of the section, as well as at the end, the approximate distance and direction of the principal populated centres.
5th. Analysis of prices		25. Special care must be taken to show on the outline plan, the towns, roads, water courses, properties etc. which are crossed or are situated in the vicinity.
6th. Detailed estimate.		
7th Statement of compensations to be paid.		
8th. Statement, number		26. The scales must be graphically shown on the plan and section and

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
progressively of the documents composing the proposal.		must also be shown in figures, as, for exemple: Scale of 0^m 002 per meter $\left(\frac{1}{500}\right)$ 27. All the plans, sections, drawings and documents without exception must be presented in the form of a packet or portfolio 0^m. 22 by 0^m. 32. 28. The plans or sections which should form part of the packet or portfolio will be doubled according to the foregoing dimensions in equal and alternate folds both as regards length and height so that they may be conveniently and easily examined 29. The plans which form part of the proposal will be drawn on transparent cloth, and the originals must be sent separately. 30. The plan of the outline will be executed on one continuous length of paper, which can be made up of sheets joined together so as to form one piece. When there is a change of direction open angles will be established determined by two lines, with a convenient width and so disposed that it will be easy to establish the angle of the two outlines. For this the paper will be doubled in two folds which will terminate in the same edge of the cloth or paper: one of the creases will be perpendicular to the edge of the paper, so as to divide into two equal parts the angle at which the

DOCUMENTS.	SCALES.	REGULATIONS TO BE OBSERVED.
		drawing is interrupted. 31. All the plans and documents which make up the proposal will be signed by the engineer charged with their preparation, and will bear the approval of those who have examined them, giving the title or occupation of each of them. *William White*, Director General.

General Law of National Railways.

The law regulating the National Railways of September 18th 1892 having been superseded by that of November 24th 1891, we consider it of interest to give the text of the latter in full, as follows:

RAILWAY LAW.

Act. No. 2873 of the 24th. November, 1891.

SECTION I.

Preliminary.

Clause 1—The construction and working of all Railways in the Republic as well as the legal questions which may arise in connection therewith, will be subject to the provisions of the present Law.

Clause 2—For the purposes of this Law the Railways are divided into National and Provincial.

Clause 3—Those considered National, are:—

1st. Railways the property of the Nation.

2nd. Those guaranteed, subsidised or authorized by the Nation.

3rd. Those joining the capital or any federal territory with one or more provinces or territories; and those connecting one province with another, or any point whatever in the territory of the Nation, with a foreign state.

Clause 4—Provincial Railways are those constructed or authorized by the Provinces within the limits of their respective territories.

SECTION II.

Regulations Relating to National Railways.

CHAPTER I.

OF THE LINE AND ITS MAINTENANCE.

Clause 5—It is the duty of every National Railway Administration from the time of the opening of the line to public service—

1—To maintain the line constantly in good condition so that it may be traversed by trains without danger, and consequently to take measures for the immediate repair of all obstacles which might impede the regular service of the line, the same regulation being understood to apply to stores, warehouses and other accessories of the railway.

2—To maintain in proper working order the rolling

stock, which must be in quality and quantity sufficient to supply the requirements of the road, having regard to the ordinary movement of traffic between the various towns and places it may connect, and being subject. so far as the construction of the line and rolling stock is concerned, to the fixed types established by the Executive Power in the ordinances relating thereto.

3—To establish Electric Telegraphs throughout the entire length of the railway and maintain them in working order for the service of the same.

4—To light the Stations and Level Crossings from sunset until the arrival of the last train.

5—To keep level crossing watchmen for the service of the barriers established at such points.

6—To insure vigilance and regularity in the working of points and crossings.

7—To close the railway at such places and to such extent as may be determined by the Executive Power.

8—To establish barriers or cattle guards at all places where Railways cross public roads or streets on the level. These barriers must be closed on the approach of each train, and opened after it has passed, to leave the ordinary road open for traffic.

9—To carry out necessary works in streets or public roads through which the railway passes, so as to leave them open for ordinary traffic.

10—To construct the culverts and works necessary for the proper drainage of adjacent properties.

Clause 6—Without prejudice to the penal responsibilities, the Railway Administrations are bound to execute the works necessary to place the line in the conditions of the foregoing article, within the time prescribed by the

Direction of Railways: but in case of urgency, or when the railways fail to carry out work which may be ordered, the Direction of Railways will proceed to the immediate execution of such works, at the expense of the respective Administrations.

Clause 7—No locomotive, tender or carriage may be used for public service without being previously inspected and authorized by the Direction of Railways.

When any locomotive, engine or vehicle, is withdrawn from service for general repairs, or on account of serious defects, the same may not again be put into service without being again inspected and authorized.

Clause 8—The Direction of Railways will cause to be examined at all times when it may deem fit, all fixed and moving structures connected with the operations of Railways, and will cause such as do not offer the necessary security to be excluded from service.

Clause 9—In the event of a Railway Administration not being satisfied with the result of the examination instituted by the Direction of Railways, the case will be submitted to the decision of technical arbitrators, and meanwhile the rolling stock or plant declared to be in bad condition must not be used until the final decision is given.

Clause 10—In granting the authorizations mentioned in the foregoing clauses, the Direction of Railways will establish as far as possible uniformity of type in the material of the permanent way and rolling stock.

Clause 11—Every Railway Administration shall maintain at stations, in trains, and throughout the entire railway, by day and night, from the commencement to the termination of the daily movement, the number of employés necessary to ensure the service being carried on with regularity and without interruption or danger of accidents.

These employés must be furnished with all necessary instructions and everything essential to the proper performance of their duties.

CHAPTER II.

OF THE FORMATION AND RUNNING OF TRAINS.

Clause 12—The formation and runnings of trains will be subject to rules established by the Executive Power, in which will be specially laid down the personal staff of each train, the number and class of vehicles and the order in which they shall be placed; the brake power and system to be employed; the signals and notices to be used; the system of communication between the engine, the employees of the train and the passengers; the maximum and minimun speed at which trains may run; the apparatus and implements to be carried by each train for use in case of accident; and the system of lighting the trains.

Clause 13—Railway Administrations must make known to the public through the medium of newspapers, and by notices posted at all stations, the general working of trains showing time of arrival and departure.

All changes in working must be made known to the public at least 15 days before being put in force through the newspapers and by notices exhibited at stations.

The time tables must be arranged with the concurrence of the Direction of Railways, which will intervene for the purpose of assuring the convenience of passengers and a satisfactory combination between the train services of the various lines.

Clause 14—Trains in movement must keep to the time and speed which the Railway Administrations have announced.

If on account of accidents or to avoid danger the speed or time of trains should be altered, the guard of the train must justify, the procedure by drawing up a statement of the circumstances which must be attested by at least three passengers.

The neglect of this formality will render the Railway Administrations responsible for the consequence of the alteration.

Clause 15—The Direction of Railways in extraordinary cases may authorize the reduction of the term fixed for the publication of the notices referred to in the foregoing clauses.

CHAPTER III.

OBLIGATIONS OF RAILWAY ADMINISTRATIONS.

Clause 16—Railway Administratons cannot prevent other railways making a junction with or crossing their lines on a higher or lower level provided that the works to be carried out do not interfere with the regular working of the original line.

In the event of a junction being made, or a crossing on the same level, the new undertaking must place a signal box at the point of intersection, and a signalman, acting under the orders of the original undertaking, must be employed for signalling the trains of both the railways in order that collisions and accidents may not happen.

To admit of one railway crossing another on the same

level, the permission of the Executive Power must be obtained, but such permission shall not be held to establish a right.

Clause 17—Railway Administrations cannot prevent their railways being crossed by ordinary cart roads. Nor can they prevent the construction of canals or artificial water-courses intersecting the railway, provided that the works undertaken for these purposes do not affect the solidity of the railway nor in any way interfere with the regularity of the train service.

Clause 18—Every Railway Administration must carry free of charge:—

1—The Post Office mail bags.

2—The Post Office employé in charge of the mail bags. The Post Master General will determine which ordinary trains are to be made use of for these purposes. The Railway Administrations must set apart a special compartment in these trains of sufficient dimensions to contain all the mail bags.

3—The officials and employees whose duty it is to inspect and watch the Railways.

4—The judicial and police authorities travelling for the purpose of investigating crimes committed at railway stations or in trains, or accidents which have occurred on the line.

Clause 19—The Executive Power or such authorities as it may determine have preferential right to the transport by railway of military forces and material of war upon giving advice to the station master of any station two hours before the departure of any train, and on payment for the transport of troops of one-half the fare of the class of seat they occupy,. and for munitions of war one-half the ordinary rates.

Clause 20—The Executive Power or the authorities which it may designate shall have the right to demand the dispatch of a special train by giving three hours previous notice and on payment of one-half the ordinary rate for special trains according to capacity.

Clause 21—In the event of civil disturbance or foreign invasion the Executive Power is at liberty to take entire control of railways on payment of compensation to the Railway Companies, such compensation to be based on the average receipts of the line during the previous half-yearly period.

Clause 22—Every Railway Administration must allow the right of use of any of its stations to other companies whose lines connect with its own, the terms and conditions of this service to be agreed upon by the parties to the arrangement.

Clause 23—When two or more railways constructed by different companies connect at any point, the carriages and waggons of any of these undertakings must be allowed to pass over the lines belonging to the others on payment of toll, and in conformity with conditions to be established by mutual agreement.

Clause 24—In the event of agreements not being arrived at as laid down in the foregoing clauses, the Direction of Railways will fix a period within which they must be concluded, and on the expiration of such period the Direction of Railways will decide what further meausures are to be taken until such time as the question in dispute shall be settled by arbitrators who must be nominated by the companies interested before the proper Tribunals.

Clause 25—Every Railway undertaking must arrange its train service, both for passengers and goods, so as to fit in with the service of other lines which have direct

connection with it, even though such lines be of different gauge.

If the Railway Administrations should fail to make arrangements for a suitable service, the Direction of Railways will fix a definite period for the purpose, on the expiration of which the aforesaid Direction will arrange the service until such time as all points at issue shall be settled by arbitrators to be named by the Railway Administrations interested before the proper Tribunal.

CHAPTER IV.

RELATING TO NATIONAL RAILWAY CONCESSIONS.

Clause 26—Companies which construct or work National Railways must have their legal domicile in the Republic. Their books must be kept in the Spanish language and bear the rubric or stamp required to fulfil the requirements of the Commercial Code.

Cause 27—In whatever place the Directorates or Administrations of National Railways may be established, there must be a properly accredited representative in the Capital of the Republic, with plenary powers for all the objects of this law, and of the respective concessions.

Clause 28—Sums of money spent by Railway Companies outside the Republic will not be recognised as expenses of Direction and Administration.

Clause 29—National Railway concessions will be considered to have lapsed unless the contracts relating thereto be drawn up within one year reckoned from the date of promulgation of the law which authorises the concession, and unless work be commenced within the periods fixed by the law relating

to concessions, or within such deferred periods as may be conceded in cases of *force majeure* recognised by the Executive Power.

Clause 30—The privileges, exemptions from taxation, premiums or subsidies conceded to National Railway enterprises will also be held to lapse in the event of total or partial interruption of the service of the line for a term of six months, except in cases of *force majeure* admitted by the Executive Power or decided by a competent tribunal.

Clause 31—Any expenditure which the Government may incur on behalf of guaranteed or subsidised Railways in accordance with the provisions of the present law will be deducted by the Direction of Railways from the first payment of guarantee or subsidy which falls due.

The Direction of Railways will recover judicially any expenditure which the Government may incur in the cases referred to on behalf of Railways which have neither guarantee nor subsidy.

Clause 32—The liability of Government for guarantee will be discharged by payment to the Companies of the amount requisite to make up the guaranteed interest reckoning as the net receipts of any line the excess of gross earnings over and above the working expenses recognised by the contract of concession.

When the law relating to the concession does not specify what are, for guarantee purposes, to be regarded as working expenses it must be understood that the working expenses are to be fifty per cent. of the gross earnings.

Working expenses will not include the cost of running special trains, unless such trains have been ordered by the Government or the public, excepting in cases of urgency as provided for in the regulations of the Executive Power.

SECTION III.

Regulations Common to all Railways.

CHAPTER I.

CARRIAGE OF PASSENGERS.

Clause 33—The charges for conveyance of persons and excess luggage must be communicated to the Direction General of National Railways, and brought to the knowledge of the public in the same manner as laid down in regard to time-tables. The regulations relating to luggage and the admission and liabilities of travellers must also be exhibited at all railway stations.

Clause 34—The ticket office of each station must be open at least 30 minutes before the announced time of departure of a train. Luggage must be received up to two minutes before the time of a train leaving.

Clause 35—Every inhabitant of the Republic possesses the right to make use of railways which are open to public service subject to the law of the country of the regulations of the railways.

The duty of the railway companies requires them to exclude from trains and stations persons whose condition might annoy the public, those who carry loaded firearms, and those who will not conform to regulations. The Companies must justify their action in such cases by means of a written document attested by the signatures least two passengers. Expulsion from a train must be effected at the nearest station, and the luggage of the persons expelled must be given up to them. In the meantime such persons may be sequestrated from others in a special compartment.

Clause 36—Every passenger enjoys the right of travelling in the same carriage to the end of the journey on each line of railway.

Clause 37—The traveller who, for want of room in the carriages is obliged to travel in a superior class to that for which he has taken a ticket, must not pay excess to the railway for making use of the higher class.

When for the same reason, a traveller has had to occupy a seat of inferior class to that specified in his ticket, the Company must refund to him at the end of the journey the entire amount paid for his ticket. If all the seats corresponding to the class for which a ticket as been issued are occupied, and thereby a passenger is compelled to stand, be can demand that one-half the price of his ticket be refunded, unless there be a special agreement to the contrary.

Clause 38—Every passenger is entitled to have carried as luggage, without additional charge, packages of which the total weight does not exceed 50 kilograms, and the Railway Company, must issue to the passenger a "check" which entitles him to delivery of the luggnge at destination.

Packages which do not incommode the public may be taken in passenger coaches.

Clause 39—The Railway Companies must deliver up to every passenger, immediatcly after arrival at destination, all packages which comprise his luggage. In the event of any package being lost or damaged, compensation must be paid in accordance with a scale of valuation which shall be established in the bye-laws of the railway and be based on the nature and value of the packages.

Clause 40—The Railway Companies are not responsible for articles which passengers take in their own charge.

Neither are they responsible for jewellery, precious stones, money, bank notes, government or other securities, nor other documents of similar character which may be contained in passengers' luggage delivered to the Company for conveyance, unless such articles have been specially and definitely declared.

Clause 41—In every railway station a register must be kept and inspected every month by the Government Inspector, in which passengers may record claims or complaints against the Railway Company and its employees, and also in passenger trains.

Clause 42—In every station a medicine chest stored with medicines, bandages and other requisites in case of accidents, must be provided.

Clause 43—In trains by which passengers are conveyed, explosive materials must not be carried. This regulation, however, does not apply to small quantities of gunpowder carried by sportsmen.

CHAPTER II.

THE TRANSPORT OF GOODS.

Clause 44—Railway Administrations must communicate to the Directions of Railways and publish the rates and regulations established for the transport of goods, in the same manner prescribed for Fares and Bye-Laws relating to passengers. Any changes which may be introduced must be publicly announced one month before coming into operation.

The rates for conveyance of passenger and goods must be just and reasonable.

Clause 45—Railway Administrations must register the

order in which packages arrive for despatch, and issue a consignment note if the consignor should require it, or otherwise must give an ordinary receipt specifying the the nature of contents and weight of packages, the total amount of freight thereon, and the time within which the transport must be completed. The despatch of goods must be made in the same order as received without giving preference to anyone, and transit must be continuous from starting point to destination, even when the goods have to be conveyed over several distinct railways.

Clause 46—Notwithstanding what is laid down in the fore-going clause, the following articles must have preference of transport:—

1st. Fruit and provisions for the daily supply of towns served by the Railway.

2nd. Passengers luggage and parcels not exceeding 50 kilograms in weight.

3rd. Mail bags and postal parcels.

4th. Articles intended for the public service and for which National or Provincial Governments claim preference of despatch as urgent.

Clause 47—Every consignor must declare before despatch the number, weight, class and description of the goods he has to despatch.

Clause 48 - On the arrival of the packages at destination, any mistake made at the station of despatch may be rectified; this right is reciprocal between the Railways and the public, and a settlement must be made at the time of the delivery of merchandise.

Any questions which may arise as to the price, weight, insufficiency of packing or covering of packages and condition of merchandise, must be sumitted at the time to the decision of the Government Inspector. Should an

Inspector be at the station and the consignor refuse to await the decision of the Direction of Railways the question must be submitted to the decision of two arbitrators appointed at the time, one on each side, with power to appoint a third in case of disagreement, both parties to pay arbitration fees in equal proportions.

Clause 49—Rates shall be uniform for all who make use of the Railway.

The Administration, notwithstanding, may reduce rates in favour of freighters who agree to a less expeditious service than the ordinary, or of those who bind themselves to forward a minimum number of tons of cargo within a stated period. Such a concession to one or more freighters must be made applicable to all who ask for it under the same conditions, and it must not be done without the previous approval of the Direction of Railway.

Clause 50—The obligations or responsibilities of Railway Administrations towards freighters for loss, damage or delay in the despatch or delivery of merchandise will be governed by the provisions of the commercial code. The provisions of the general laws of transport will be applicable in all points not provided for in the present law.

Clause 51—Articles left in railway carriages, or at stations, or found on the line, or those whose owners, consignors or consignees are not known, must be deposited in a lost property office by the Railway Administrations and entered in a special register specifying the date and place in which they were found, and their principal distinctive marks.

Clause 52 - Articles deposited in lost property offiices must be publicly announced by means of notices in stations. If the owners do not appear to claim them within three months dating from the posting of the

notices, they must be sold by public auction, the proceeds being placed at the disposal of the Judge having jurisdiction in the matter, who will order it to be paid into the State Exchequer, after deduction of all expenses incurred.

Clause 53—If the articles should be of a perishable nature, they must be immediately sold by public auction, with the previous sanction of the Government Inspector, the proceeds being disposed of in accordance with Clause 52.

CHAPTER III.

OF THE SERVITUDES TO WHICH RAILWAYS GIVE RISE.

Clause 54—The proprietors of lands adjoining the railway lines must not throw rubbish into nor obstruct the side ditches, nor make use of them as drains, excepting properties which have their natural drainage towards the railway.

Clause 55—Every person not in the service of the railway, is forbidden to enter or remain thereupon, excepting public servants in the execution of their duty. It is also forbidden to drive any class of animals along the railway, which must be crossed only at the places provided for the purpose, the driver being obliged in such case to make them leave the railway on the approach of a train. The same rule applies to drivers of carts or other vehicles.

Clause 56—It is prohibited at a less distance than twenty metres from the railway:—

1st. To open ditches, make excavations, work quarries or mines, and in general to execute any works of similar character which might be prejudicial to the solidity of the railway.

2nd. To construct buildings with thatch or other inflammable material.

3rd. To form enclosures, seed plots, deposits or warehouses of inflammable or combustible articles.

Clause 57— It is also prohibited at a less distance than twenty metres from the railway:—

1st. To make outlets in walls or fences giving upon the railway, with the exception of properties which the railway may intersect, in which such outlets may be made with the permission of the administrative authority.

2nd. To make deposits or warehouses for grain, building materials, and other articles.

Clause 58—It is likewise prohibited:—

1st. To construct walls or make enclosures at less distance than two metres from the railway.

2nd. To make plantations of trees at less distance than twelve metres from the railway.

Clause 59—The provisions of the foregoing clauses are not applicable to the owners of properties which open upon public streets through which a railway passes within the limits of towns or cities.

Clause 60—If any one of the works specified in the foregoing clauses should exist at less distance than provided by said clauses at the time when a railway is constructed, it may be expropriated on the application of the constructing company. If expropriation is not effected, no works may be executed beyond those necessary to retain already existing works in the same condition, reconstruction being prohibited in the event of existing structures being destroyed (falling into ruin); but in such case the railway must

indemnify proprietors for damages resulting from the servitude imposed.

Clause 61—The provisions contained in the second article of clause 57 do not apply to:—

1st. The deposit of non inflammable materials so long as the height does not exceed that of the earthworks on which the railway is carried.

2nd. The deposit or temporary accumulation of building materials or articles destined for cultivation.

3rd. The storage of harvest products during harvesting. In these cases the railways will not be held responsible for loss or injury occasioned by the working of the railway, unless wilful negligence on their part or on that of their agents be proved.

Clause 62—The distances specified in the foregoing clauses must be measured horizontally from the bottom of the slopes of embankments, from the top of the slopes in cuttings, and from the outer edges of side ditches, or if these do not exist, the distances must be measured from a line drawn at a metre and a half from the outer rail of the line.

Clause 63—Without prejudice to the corresponding penalty, those who contravene the preceding clauses will be obliged to restore things to their former state, and to answer for all damages occasioned. If within the term specified by the judge before whom complaint is laid the author of the infringement should not have restored things to their former condition, the railway may do so at the expense of the former, having previously obtained the sanction of the competent tribunal.

CHAPTER IV.

DUTIES OF RAILWAY ADMINISTRATIONS.

Clause 64—Connected Railway undertakings must be considered as a single undertaking for all purposes connected with contracts for conveyance without prejudice to questions of law which may arise between the different companies in regard to the terms or conditions of agreements among themselves.

Clause 65—It is the duty of the Railway Administrations to see that all their employees are diligent and capable. The responsibility of the Railways towards passengers and freighters for damages which may be the result of negligence on the part of their employees, extends to all acts perfomed by the latter in the discharge of their duties.

In cases of accident the onus of proving that loss or injury was the result of inavoidable causes or *force majeure* is imposed on the Railway authorities.

Clause 66—Any clauses in the regulations of Railways in consignment notes, or on tickets, introduced for the purpose of exonerating the railways from liabilities which the laws impose, are null and void.

Clause 67—The Administrations of Railways which serve the same district are absolutely forbidden to enter into arrangements among themselves with the object of maintaining definite rates, or to establish a joint purse in which the proceeds are divisible in fixed proportions, and in the event of such agreements being entered into. every day these arrangements are in force will be regarded as a separate offence.

Clause 68—The Railways which fix their rates without

the intervention of Government must not, for the purpose of competing with other carrying agencies by land or water subsequently established. alter them during a period of five years, dating from the commencement of the works necessary for the establishment of such carrying agencies.

SECTION IV.

Government Inspection.

CHAPTER I.

RAILWAYS OPEN TO TRAFIC.

Clause 69—It is the duty of the Direction-General of National Railways:—

1. To see that the Railway service is conducted in accordance with the present law.
2. To inspect the National Railways open to traffic, and exact compliance with the obligations imposed.
3. To examine and settle the accounts of railways guaranteed, subsidized, or leased by the State, and to supervise the management and audit the accounts, for the purpose of protecting the interest of the Exchequer and secure the fulfilment of the respective contracts, a separate account being opened for each Railway.
4. To impose upon the Railways tho fines authorised by this law and by the special regulations in force, and enforce payment by judicial means. Judges may not allow appeals against payment of the fines, but only for the purpose of remitting them

after they have been paid. Government will not admit as working expenses of Railways amounts paid by the latter by way of fines.

5. To watch over the compliance with the terms of the concessions relating to National Railways open for public service.

6. To keep under observation everything which relates to the working of Railways which are National property.

7. To place before the Executive proposals for the construction of new railways, branch lines and stations in places where it considers that the better means of communication and the requirements of industry demand such accomodation.

8. To give its opinion, after the Engineers' Department has reported, on railway projects to be presented to the Executive or to Congress.

9. To submit for approval of the Executive the regulations to which the management and working of State Railways should be subject, laying down as far as possible the duties of each employee according to grade, and to give its opinion in regard to Regulations submitted by private companies in compliance with the present law within such period as will be peremptorily fixed by the said Direction.

10. To issue instructions for the guidance of inspectors of National Railways open for public service.

11. To submit to the Executive the tariffs which should be applied on Railways which belong to the State, and give their opinion in those cases in which the Executive is entitled to intervene in

the arrangement of the Rates of Railways belonging to private companies.

12. To attend to claims made against the Administrations of National Railways in accordance with this law.
13. To exact from Admininistrations of Railways belonging to the State open to public service, the submision of monthly, quarterly and half-yearly accounts of expenditure and receipts which are to be examined and forwarded to the Accountant General with report.
14. To draw up each year, conjointly with the Engineers' Department, a map of all the Railways in the Republic, whether open or in construction, showing their outline, length, gauge, the territories traversed by them, and whether they belong to the Nation, the Provinces, or to private Companies.
15. To determine from time to time, with the previous approval of the Executive, the rolling-stock which each National Railway should maintain in ordinary use, having regard to the movement of goods and passengers between the various points served by it.
16. To fix the names of stations on National Railways, preference being given to the names of localities in which stations are situated, and to alter names at present in use when they lead to confusion. The Railway Administrations must not employ names other than those determined by the Direction General of Railways.
17. To compel Railway Companies to dismiss employees whom it may consider dangerous to the safety of passengers and the preservation of public order.
18. To arrest and bring before a competent tribunal

persons who come under the provisions of clause 81, calling in the aid of the public force in cases of urgency.

Clause 70—The Direction General of Railways is empowered to demand from Railway Administrations all the information it may deem necessary to enable it to discharge its duties and fulfil the objects for which it was created. It may call on witnesses to appear and give evidence, for the production of books, papers, tariffs, contracts, settlements and documents which have reference to the matter under investigation.

Clause 71—Every person association of persons who may consider themselves aggrieved by the acts or omissions of Railway Administrations in contravention of this law may submit a brief statement of the facts to the Direction General of Railways. The Direction will transmit a report containing the accusations to the Railway Administration calling upon it to give satisfaction or reply in writing within a reasonable period to be fixed by the Direction. If within the time allowed, the Railway Administration makes amends for the alleged injury it will be exempt from further responsibility for that particular transgression. If the Administration fails to settle the claim within the term fixed or sufficient cause is shown to warrant an investigation, the Direction of Railways must order an investigation in the manner and by the methods it may consider convenient. No complaint must be rejected on the plea that the party making the complaint has sustained on direct injury.

Clause 72—In every investigation the Direction of Railways must reduce the results to writing and set forth the facts upon which conclusions are based, and the dictates of the Direction General of Railways will hold good in law unless

the contrary is proved. The dictates of the Direction General must be filed in its office, and copies given to the party interested.

Clause 73—In every investigation, the Direction of Railways must set forth clearly and definitely the act or omission which is contrary to law, or the damage or injury caused by its infringement. A copy must be delivered forthwith to the Railway with notice to suspend and desist from further infringement, or to remedy the injury, or both at one time, within a reasonable term to be fixed by the Direction of Railways. If within the appointed term it is proved to the satisfaction of the Direction of Railways that the infringement has been stopped and the injury been remedied, in accordance with its decision or to the satisfaction of the aggrieved person, the circumstances must de recorded, the Railway Administration being relieved from future responsibility in respect of the aforesaid infringement.

Clause 74—The Direction of Railways will demand from every Railway Administration, in the time and form it may determine, annual reports upon the following points: –

1. The amount of capital issued, paid up, and the form of payment.
2. The dividend paid, the amount of reserve fund, if any, and the number of shareholders.
3. The consolidated and floating debts and the interest they carry.
4. The cost and value of the movable and immovable assets of the Railway.
5. The number and class of employees and their renumeration.
6. The sums set aside yearly for improvements, the method of spending this money, and the nature of these advances.

7. The receipts and expenses of each department or of any other character.
8. A balance of profit and loss.
9. A complete report on the administration and all its operations during the year.
10. The information which may be called for by the Directions of Railways concerning rates tand conditions of transport, or relating to agreements wiih other railways.

Clause 75—It is also compulsory for the Railway Administrations to reply to all special questions in regard to which the Direction of Railways may require information, as well as to fill up all statistical forms which the Direction of Railways may send for that purpose.

Clause 76—The Direction of Railways, authorised by the Executive, may appoint a period within which the Railways must introduce a uniform system of accounts.

CHAPTER II.

RAILWAYS IN CONSTRUCTION.

Clause 77—To the Department of Public Works it appertains:

1. To report upon Railway projects which may be submitted to Congress or to the Executive Power, and also upon plans, specifications and tenders ralating thereto.
2. To submit proposals to the Executive Power for the construction of new railways, branch lines, and stations in such places as it considers necessary.
3. To take charge of the inspection of National Railways in construction, and to occupy itself about

purchase of materials for the Railways which the Nation may construct at its own cost.

4. To submit to the Executive Power regulations for the construction of National Railways, and issue instructions for guidance of inspectors of those works.
5. To draw up each year, conjointly with the Direction of National Railways a map of the railways for which concessions have been granted, those projected, and those open for traffic.
6. To introduce uniformity in the accounts of Railways constructed for the Nation or under its guarantee or subsidy, and to solicit from the Executive Power at the proper time, the resolution declaring the period of construction in each case to have expired.
7. To determine the construction capital of each National Railway, in accordance with the plans, specifications and final estimates, and to settle the capital expended in railways constructed at the cost of the Nation.

CHAPTER III.

FACULTIES OF INSPECTORS.

Clause 78—The Direction of Railways and the Public Works Department may reciprocally call for any reports they may require in the discharge of their duties.

Clause 79—The Inspectors of the Direction of Railways and of the Public Works Department must be allowed free access to the stations, workshops, railway lines, trains and adjuncts of the National Railways.

SECTION V.

Penal Clauses.

CHAPTER I.

OFFENCES AFFECTING THE SAFETY OF THE PUBLIC AND RAILWAY TRAFFIC.

Clause 80—Directors, managers, employees, trustees or receivers, lessees, agents and other persons carrying on operations in the name of a Railway undertaking will be considered guilty of infringement of this law whether they act individually or colectively, or whether they influence or consent to anything prohibited or declared unlawful, or whether they omit to comply with anything herein prescribed, and for each infringement they may be punished by arrest for a period not exceeding one month, or by fine of from one hundred to one thousand dollars.

Clause 81—Any person who intentionally destroys a barrier at level crossing or employs other means to delay or retard the running of a train, or to cause it to leave the rails, will be punished by arrest for a period of from three months to one year.

If the object which the delinquent had in view be effected, the punishment will be simple imprisonment of from one to three years.

If the accident should cause bruises, wounds, of fractures to any person, the penalty may extend to from three to eight years confinement with hard labour.

If the accident causes the death of one or more persons, the penalty will be not less than eight years imprisonment,

and the tribunals are empowered to apply up to the extreme penalty.

Clause 82—A verbal or written threat to commit any of the offences specified in the previous clause when made with the object of causing employés of a railway to abandon their post of duty will be punished by arrest extending from one to six months, or by a fine of fifty to one hundred dollars.

Clause 83—Every individual who through imprudence, neglect or inobservance of regulations may involuntarily cause an accident from which injuries to one or more persons may result will be published by arrest of from one month to one year, or by a fine of one hundred to one thousand dollars, without perjudice to the liability of compensation for damages.

It the accident causes death of one or more persons the penalty will be simple imprisonment for from one to five years.

If the person who caused the accident be a railway employee. the Railway Administration will be held responsible for the damages and loss caused thereby in accordance with Clause 65.

Clause 84—Enginemen, mechanics, conductors or guards of trains and other employees who abandon their post, or are found intoxicated during their working hours will be punished by arrest of from one month to a year, or by fine extending from one hundred to a thousand dollars.

If in consequence of the abandonment of their post or being intoxicated accidents happen which cause death or injury to any person, the penalty will be in the first case from three to eight years imprisonment with hard labour, and in the second case from one to three years simple

imprisonment, without perjudice to the liability of the Railway Administration to make compensation.

If the desertion or intoxication be with criminal intention, the culprit will be punished in accordance with Clause 82 with an addition of one third when the case is not one for the application of the extreme penalty.

Clause 85—Every person who wilfully cuts telegraph wires intended for the service of a railway or who pulls down or destroys telegraph posts, or does any other act tending to interrupt telegraphic communication, will be punished by arrest of from two months to a year. If accidents to trains should result from the act, the penalty will be from one to three years simple imprisonment. If from these accidents the death or injury of any person should result, the penalty will be from three to ten years imprisonment with hard labour.

Clause 86—Every attack or resistance with violence made upon the agents or employees of Railways when occupied in the execution of their duty will be punished with arrest of from fifteen days to three months, or by fine of from fifty to three hundred dollars.

Clause 87—If any offence be committed in a train while running, the guard of the train must take the necessary measures to secure the delinquent who must be placed at the disposition of the judicial authority at the nearest station, together with a detailed statement of the criminal act and a declaration of the persons who witnessed it. In fulfilment of this duty the guard will have faculties and authority such as are allowed to police agents.

Clause 88—Station masters, guards of trains and other employees whose duty it is to keep watch over the movement of Railway traffic may call for the assistance of

the public force and that of individuals for the purpose of giving effect to the regulations which relate to the aforesaid security, and also for the purpose of arresting delinquents.

Clause 89—Infringements of the present law committed with criminal intent and for which no special penalty is prescribed will be punished by the tribunals with simple arrest for a term of from one to six months or a fine of from fifty to one thousand dollars, on the evidence of inspectors, of passengers, or of the Railway authorities, or at the instance of the Fiscal Ministry.

Clause 90—The police force for maintenance of law and order within railway stations and in trains will be governed by a special set of regulations to be draw up by the Railway authorities and approved by the National or Provincial Executive.

CHAPTER II.

OFFENCES COMMITED BY RAILWAY ADMINISTRATIONS.

Clause 91—Railway Administrations are responsible for acts or omissions which contravene the present law and the reglamentary decrees bassed thereon and are not at liberty to tranfer the liability to their employees.

Clause 92—Every infraction of the law and decrees committed by Railway Administrasions will be punished with fines of from five hundred to the thousand dollars, and day which is allowed to transpire after receipt of an order from the Government Inspection during which Railway Administrations shall fail to comply with the law will be considered as constituting a separate offence.

Clause 93—In case of a second offence the fines authorised by the foregoing Clause will be doubled.

SECTION VI.

Miscellaneous Clauses.

Clause 94—The Executive will impose fines of from one hundred to a thousand dollars in punishment of any infringement of regulations which it may decree or approve, especially such as involve neglect or inattention on the part of Railway Administrations and their employees towards passengers and freighters.

Clause 95—The amount of the fines imposed on National Railway Administrations in accordance with this law will be applied to the formation of a special fund for the establishment and support of a school of engine-drivers and firemen.

Clause 96—Every account for guarantee due from the National Government must be presented to the Direction General of Railways for submission to the Minister of the Interior, together with a summary of the operations which the Direction is required to perform in accordance with clause (69) (3).

Clause 97—Railway employees engaged at stations and on trains, and all those whose duties bring them necessarily in communication with the public and the authorities must be able to speak Spanish.

Clause 98—When a railway passes over navigable rivers it must be so constructed as not to impede navigation. If it crosses unnavigable rivers, watercourses or irrigation channels, the works must be carried out in such manner as not to interfere with the use of the waters.

Clause 99—The Railway Law dated September 18th, 1872, and regulations contrary to the present law, are hereby annulled.

Clause 100—Notwithstanding the provisions of clause 99, existing orders relating to the formation and march of trains will remain in force until such time as the Executive shall issue the necessary regulations to give effect to the portion of the present law relating thereto.

Clause 101—Until such time as a special law relating to conveyance by water be enacted, the present law shall be applicable to such conveyance whenever suitable.

Clause 102—Let this be communicated to the Executive Power.

Given in the Chamber of Sessions of the Argentine Congress in Buenos Aires, under date November the eighteenth, one thousand eight hundred and ninety-one.

MIGUEL M. NOUGUÉS. BENJAMIN ZORRILLA.

Benigno Ocampo,
Secretary of the State.

Uladislao S. Frias,
Secretary of the Chamber of Deputies

It is hereby decreed.

That the above shall become National law, to publish same and archive in the National Register.

PELLEGRINI.

JOSÉ V. ZAPATA.

RAILWAY ADVANCEMENT.

The first Railway established in the Argentine Republic was the Western of Buenos Aires, the first section of which, 10 kilometers in length, was opered to public traffic in 1857. The rate of railway in the Argentine Republic an has been as follows:

YEARS.	KILOMETER.
1857	10
1860	39
1865	213
1870	732
1875	1384
1880	2313
1885	4541
1890	9255
1892	12990

The following statements show how these 12.990 kilometers are distributed:

WESTERN BUENOS AIRES RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Between Stations	From Once	From Central	
					meters
1	Once de Setiembre	0	0	8.5	19.4
2	Almagro	1.1	1.1		23.5
3	Caballito	3.2	4.3		23.1
4	Flores	1.6	5.9		23.2
5	V. Sarsfield	1.4	7.3		21.
6	Liniers	4.4	11.7		20.1
7	Ramos Mejia	3.4	15.1		23.2
8	M. J. Haedo	3.	18.1		26.4
9	Morón	2.2	20.3		21.3
10	Ituzaingó	4.6	24.9		26.5
11	Merlo	5.7	30.6		14.6
12	Moreno	5.9	36.5		22.8
13	Rodríguez	14.7	51.2		31.1
14	Luján	15.3	66.5		28.4
15	Jauregui	6.9	73.4		26.3
16	Olivera	8.1	81.5		28.5
17	Gowland	9.3	90.8		33.3
18	Mercedes	7.4	98.2		39.5
19	Suipacha	27.4	125.6		46.1
20	Gorostiaga	16.8	142.4		49.5
21	Chivilcoy	15.2	157.6		53.6
22	Benitez	13.8	171.4		52.1
23	Alberti	15.6	187.		53.9
24	Larrea	8.4	195.4		56.6
25	Bragado	13.3	208.7		56.4
26	Olascoaga	18.	226.7		57.3
27	Dennehy	17.7	244.4		66.5
28	Nueve de Julio	16.6	261.		75.4
29	French	13.2	274.2		78.9
30	Cambaceres	12.	286.2		79.7
31	Casares	23.1	309.3		81.7
32	Güanaco	27.1	336.4		85.6

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Between Stations	From Once	From Central	
					meters
33	Chiclana	9.1	345.5		85.2
34	Pehuajó	17.1	362.6		85.6
35	Castelli.	16.4	379.		85.9
36	Passo	21.4	400.4		85.9
37	Berutti.	19.3	419.7		86.6
38	La Junta.	13.	432.7		88.9
39	Trenque Lauquen .	10.6	443.3	451.8	94.9

Once de Setiembre and Catalinas branch.

1	Once de Setiembre	0.	0.	8.5	19.4
2	Las Catalinas. . .	6.	6.	2.5	4.8

Once de Setiembre and Produce Market branch.

1	Once de Setiembre	0.	0.	8.5	19.4
2	Produce Market. .	13.	13.	21.5 via B. A. W. R'y.	4.7

Haedo and La Plata branch.

1	Haedo	0.	0.	26.6	26.4
2	San Justo	5.	5.		24.3
3	Santa Catalina . .	16.2	21.2		16.1
4	J. Mármol	5.4	26.6		22.7
5	Claypole	4.1	30.7		18.8
6	Varela.	6.1	36.8		22.
7	J. Gutiérrez . . .	8.5	45.3		18.8
8	Pereyra Juncture .	10.4	55.7		10.4
9	Adolfo Alsina. . .	6.9	62.6		10.7
10	Ringuelet.	1.4	64		8.1
11	Tolosa	2.7	66.7		11.5
12	La Plata.	3.6	70.3	Vía B. A West: Railway 96.9 Vía B. A. Ensenada Railway 56	19.

La Plata and River Santiago branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters.
1	La Plata.	0.	0.	Vía B. A. W. 96.9 Vía B. A. Ensenada 66.6.	19.
2	La Plata port. . .	2.8	2.8		13.9
3	Central Dock. . .	5.9	8.7		7.
4	Mole.	0.5	9.2		5.1
5	Río Santiago . . .	1.4	10.6	Vía B. A. W. 107.5. Vía B. A. Ensenada 66.6.	4.9

Tolosa and Ensenada Junction branch.

1	Tolosa.	0.	0.	Vía B. A. W. 93.3. Vía B. A. Ensenada 52 4.	11.5
2	Ensenada Junction.	6.5	6.5	Vía B. A. W. 99.8. Vía B. A. Ensenada 58.9.	4.9

Tolosa and Elizalde branch.

1	Tolosa.	0.	0.	Vía B. A. W. 93.3. Vía B. A. Ensenada 52.4.	11.5
2	La Plata port. . .	3.	3.		13.9
3	Elizalde	8.	11.	B. A. W. line 104.3 B. A. Ensenada 69.9	28.2

Pereyra Junction and Pereyra Station branch.

1	Pereyra Juncture .	0.	0.	B. A. W. 82.3. B. A. Ensenada 41.4	10.4

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From P. Constit'n	From Central Station	
					meters.
2	Pereyra	2.	2.	B. A. W. 84.3. B. A. Ensenada 39.4	13.2

Marmol and Temperley branch.

1	Marmol	0.	0.	B. A. W. 53.2. Southern 22.	19.6
2	Temperley	2.1	2.1	B. A. W. 55.3. Southern 19.9	19.1

GREAT SOUTHERN RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betw'en Stations	From P. Constit'n	From Central Station	
					meters.
1	P. Constitución . .	0.	0.	9.2	16.2
2	Barracas N. . . .	2.8	2.8		5.4
3	Barracas S.	0.8	3.6		5.4
4	Lanús	5.4	9.		8.7
5	Banfield	4.	13.		12.9
6	Lomas de Zamora .	2.	15.		18.2
7	Temperley	1.3	16.3		19.1
8	Adrogue	2.8	19.1		23.1
9	Burzaco	3.1	22.2		26.6
10	Glew.	7.	29.2		28.3
11	San Vicente . . .	10.	39.2		24.4
12	Donselar	12.9	52.1		17.4
13	Ferrari.	12.1	64.2		16.9
14	Jeppener.	13.	77.2		15.4
15	Altamirano	10.2	87.4		15.2
16	Alegre.	15.7	103.1		19.1
17	Ranchos	8.3	111.4		21.4
18	Villanueva	20.6	132.		19.5
19	Bonnement. . . .	5.	137.		18.6
20	Salado	6.4	143.4		21.3
21	Chas.	14.4	157.8		21.9
22	San Pedro	19.1	176.9		25.8
23	Rosas	14.6	191.5		32.
24	Las Flores	17.	208.5		36.7
25	Coiorada	21.	229.5		47.7
26	Pardo	13.5	243.		57.8
27	Cacharí.	19.3	262.3		74.4
28	Parisch.	19.5	281.8		89.4
29	Shaes	14.4	296.2		108.4
30	Azul.	21.8	318.		138.
31	Hinojo.	29.	347.		157.3
32	Olavarría	15.	362.		163.9
33	Pourtale	28.2	390.2		186.6
34	Muñoz.	17.	407.2		184.3
35	Rocha	20.6	427.8		176.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters.
36	Las Martinetas . .	13.5	441.3		177.8
37	La Gama.	13.2	454.5		171.7
38	La Colina	27.7	482.2		195.4
39	Sauce Corto . . .	37.5	519.7		237.4
40	Currumalán. . . .	15.6	535.3		250.5
41	Arroyo Corto. . .	17.7	553.		272.5
42	Pigüe	14.8	567.8		288.2
43	Alfalfa.	20.3	588.1		341.7
44	Tornquist.	40.7	628.8		285.8
45	Napostá	40.6	669.4		194.2
46	La Vitícola. . . .	13.4	682.8		131.2
47	Bahía Blanca. . .	26.6	709.4	Vía Altamirano and Azul 720.3 / vía Maypú, and Tres Arroyos 766.6 vía Flores, and Tandil 731.1	20.3
48	Bahía Blanca Port.	7.3	716.7		5.7

Lanús Junction and Boca branch.

1	Lanús junction . .	0.	0.	9.3	6.2
2	Boca.	5.8	5.8	15.1	4.7

Temperley and Cañuelas branch.

1	Temperley	0.	0.	19.9	19.1
2	Llavallol	5.	5.		30.8
3	Monte Grande. . .	4.1	9.1		17.2
4	Ezeiza	5.9	15.		22.
5	Tristán Suárez . .	5.7	20.7		20.5
6	Máximo Paz . . .	7.	27.7		18.2
7	Vicente Casares. .	4.1	31.8		21.8
8	Cañuelas	15.7	47.5	67.4	34.8

Altamirano and Bahía Blanca Port branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters
1	Altamirano	0.	0.	91.	15.2
2	Gándara	10.9	10.9		17.6
3	Chascomús	15.	25.9		12.4
4	Adela	15.4	41.3		10.
5	Monasterio	9.7	51.		9.6
6	Lezama	13.	64.		10.9
7	Guerrero	11.5	75.5		7.8
8	Taillade	14.	89.5		9.9
9	Sevigne	14.1	103.6		10.3
10	Dolores	12.4	116.		7.9
11	Parravicini	19.1	135.1		9.3
12	Velázquez	21.2	156.3		10.7
13	Maipú	25.4	181.7		16.1
14	Rodríguez	21.9	203.6		30.6
15	Fair	23.	226.6		53.6
16	Ayacucho	17.8	244.4		73.9
17	Reconquista. . . .	20.7	265.1		10.5
18	Iraola	21.3	286.4		139.6
19	Tandil	21.4	307.8		178.3
20	Pilar	25.	332.8		173.8
21	Vela	19.8	352.6		219.9
22	López	19.7	372 3		224.7
23	Juárez	20.3	392.6		214.8
24	Alzaga	26.4	419.		194.6
25	González Chavez .	21.6	440.6		194.7
26	Vázquez	18.2	458.8		154.5
27	Tres Arroyos . . .	24.4	483.2		108.
28	Micaela Cascallares	22.3	505.5		116.5
29	Irene	21.	526.5		100.
30	Aparicio	18.	544.5		110.1
31	Las Mostazas. . .	37.7	582.2		112.
32	San Román. . . .	13.1	595.3		100.4
33	Bajo Hondo . . .	14.6	609.9		67.2
34	Grünbein	23.6	633.5		24.1
35	Bahía Blanca Port.	95.	643.	Via Altamirano and Azul 720.3 via Maipú and Tres Arroyos 786.6 via Flores and Tandil 731.1	4.6

Maipú and Mar del Plata branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters.
1	Maipú	0.	0.	272.7	16.1
2	Coronel Dorrego. .	25.6	25.6		21.8
3	Pirán	22.1	47.7		24.2
4	Arbolito	21.2	68.9		26.1
5	Vivarata	23.2	92.1		28.2
6	Cannet.	25.8	117.9		26.7
7	Mar del Plata. . .	13.1	131.		16.3

Hinojo and Sierra Baya branch.

1	Hinojo.	0.	0.	350.6	157.3
2	Sierra Baya.	5.5	5.5	356.1	216.8

Hinojo and Sierra Chica branch.

1	Hinojo.	0.	0.	350.6	157.3
2	Sierra Chica . . .	7.7	7.7	358.3	170.3

Branch from Olavarría to Estancia.

1	Olavarría.	0.	0.	365.6	163.9
2	Estancia Dávila. .	13.	13.	378.6	196.8

Tandil and Las Canteras branch.

1	Tandil.	0.	0.	398.8	173.3
2	Las Canteras . . .	5.3	5.3	404.1	213.1

Merlo and Saladillo branch.

1	Merlo	0.	0.	39.1	14.6
2	C. Suárez.	4.2	4.2		22.3
3	M. Paz.	13.1	17.3		30.
4	G. Hornos	14.2	31.5		33.3
5	Las Heras	4.7	36.2		36.1

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From junction	From Central	
					meters
6	Zapiola.	16.9	53.1		34.5
7	Lobos	15.2	68.3		28.3
8	S. María	15.3	83.6		30.4
9	R. Pérez	18.9	102.5		33.9
10	Del Carril.	19.9	122.4		36.6
11	Cazón	15.7	138.1		41.6
12	Saladillo	15.3	155 4	109.5	46.7
	Las Flores and Tandil branch.				
1	Las Flores	0.	0.	214.9	36.7
2	Plaza Montero . .	15.5	15.5		43.7
3	Colman.	29.3	44.8		58.5
4	Santa Rosa. . . .	38.3	73.1		75.9
5	Rauch	17.2	90.3		94.1
6	Egaña	21.	111.3		114.3
7	De la Canal . . .	18.4	129.7		135.2
8	Tandil.	21.5	151.2	Via Las Flores 366.1 Vía Maipú 398.8	179.3
	BUENOS AIRES AND ENSENADA PORT RAILWAY.				
	GUAGE 1.676 M.				
1	Central.	0.	0.		11.3
2	Venezuela	0.7	0.7		9.5
3	Casa Amarilla (Yellow house). . .	1.4	2.1		6.3
4	General Brown . .	1.5	3.6		5.1
5	Boca.	0.6	4.2		6.3
6	Peña Barraca. . .	0.5	4.7		5.2
7	Tres Esquinas. . .	0.8	5.5		6.4
8	North Barracas . .	0.9	6.4		7.5
9	Barracas Iglesias. .	0.7	7.1		5.9
10	General Mitre. . .	2.9	10.		6.2
11	Wilde	4.	14.		7.5
12	Bernal.	3.	17.		21.3
13	Quilmes	2.6	19.6		19.1
14	Espeleta	3.5	23.1		22.8

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Central		
					meters
15	Barazategui. . . .	3.1	26.2		22.3
16	Godoy.	4.	30.2		9.1
17	Conchitas.	1.6	31.8		11.6
18	Pereyra	7.6	39.4		13.2
19	Punta Lara. . . .	10.8	50.2		6.
20	Ensenada.	9.7	59.9		5.7

Ringuelet and Ferrari branch.

			From junction	From Central	
			—	—	
1	Ringuelet.	0.	0.	Vía Pereira 49.7 Haedo 90.6	8.1
2	Hernández	3.9	3.9		18.9
3	M. Romero	5.2	9.1		25.
4	Abasto	5.4	14.5		28.
5	Gómez.	11.6	26.1		22.1
6	Brandzen.	11.9	38.		16.9
7	Ferrari.	0.5	38.5	Vía Pereira 88.2 Haedo 129.1 South Rly 70.6	16.5

Elizalde and Magdalena branch.

1	Elizalde	0.	0.	Vía Pereyra 73.4 Haedo 104.3	28.2
2	Correas	12.5	12.5		15.7
3	B. Bavio.	10.8	23.3		22.9
4	Arditi	10.8	34.1		9.3
5	Magdalena	13.1	47.2	V.Pereyra 120.6 Haedo 151.5	8.3

CENTRAL ARGENTINE RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL.
		Betwe'n Stations	From Rosario	From Central Buenos Aires	
					meters
1	Rosario	0.	0.	Via B. A. and R. 303.8 Central Arg'tine 354.8	22.4
2	Fishertown	9.6	9.6		23.4
3	Avila	6.8	16.4		32.9
4	Roldán	9.2	25.6		39.7
5	San Gerónimo	11.1	36.7		49.4
6	Carcarañá	11.9	48.6		53.1
7	Correa	9.9	58.5		68.2
8	Cañada de Gómez	13.6	72.1		92.9
9	Armstrong	20.	92.1		118.2
10	Tortugas	20.8	112.9		74.1
11	General Roca	8.9	121.8		87.4
12	Marcos Juárez	18.2	140.		113.9
13	Leones	18.5	158.5		116.
14	San Marcos	17.5	176.		115.1
15	Kilometer 186.5	10.5	186.5		122.3
16	Belle Ville	9.9	196.4		129.3
17	Kilometer 210.	13.6	210.		142.5
18	Ballesteros	15.	225.		160.6
19	Cárcano	13.	238.		178.1
20	Villa María	15.8	253.8		203.
21	Tiopujío	17.2	271.		229.5
22	Chañares	17.2	288.2		248.9
23	Oliva	16.8	305.		266.5
24	Oncativo	18.	323.		284.7
25	Laguna Larga	18.7	341.7		310.5
26	Pilar	13.3	355.		337.
27	Rio Segundo	3.8	358.8		342.6
28	Toledo	14.2	373.		371.9
29	Ferreyra	14.	387.	Via B. Aires and C. Arg. lines 699.2 Via C. Arg. 703.7 Via Pacific and C. Arg. 788.4	
30	Córdoba	8.4	395.4	Via B. Aires and R. and Cord. 736.3 Via C. Arg. and C. Cord. 758.4	

Luján and Cañada de Gómez branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Buenos Aires	
					meters.
1	Luján	0.	0.	via B. A. West 75.	28.4
2	Carlos Keen. . . .	16.3	16.3		37.6
3	Azcuénaga	19.6	39.9		37.5
4	S. Antonio de Areco	15.3	51.4		34.
5	Duggan	15·7	67.1		51.5
6	C. Sarmiento . . .	15.3	82.4		45.6
7	Saavedra.	15.	97.4		44.5
8	Arrecifes.	16.6	114.		39.7
9	Viñas	14.1	128.1		50.
10	Anchorena	16.9	145.		71.9
11	Pergamino	17.1	162.1		67.2
12	El Socorro	29.	191.1		72.2
13	Peyrano	16.7	207.8		66.8
14	Francisco Paz. . .	15.1	229.9		70.9
15	Wilde	13.7	236.6		75 3
16	Fuentes	19.	255.6		78.3
17	Candelaria	17.9	273.5		81.9
18	Cañada de Gómez.	31.9	305.4		83.4

Pergamino and San Nicolás branch.

1	Pergamino	0.	0.	B. A. West & C. A. 237.1 B. A. & Ros. & C. Arg. 310.7 Pacific & C. Arg. 343	67.2
2	A. de la Peña. . .	11.4	11.4		76.1
3	Acevedo	10.5	21.9		67.3
4	Guerrico	13.7	35.6		68.2
5	Conesa	5.5	41.1		55.8
6	Rojo.	14.9	56.		40.7
7	San Nicolás. . . .	20.1	76.1	West & C. Arg. 313.2 B. A. & R. 242.7	18.

Pergamino and Junín branch.

	STATIONS.	DISTANCE IN KILOMETERS. Betw'en Stations	From Junction	From Central Buenos Aires	HEIGHT ABOVE SEA LEVEL
					meters.
1	Pergamino	0.	0.	B. A. West & C. Arg. 237.1 B.A. & R. & C.A. 310.7 Pac:& C.Arg:343	67.2
2	Ortiz Basualdo . .	19.9	19.9		77.1
3	R. Cano	6.4	26.3		82 6
4	Rojas	14.	40.3		66.9
5	E. Echevarría. . .	18.8	59.1		74.7
6	Roca.	17.6	76.7		78.7
7	Junín	12.3	89.	B. A. West & C. Arg: 326.1 Pacific 255.7	81.1

Branch line from Cano to Estancia Cano.

1	Cano.	0.	0.		68.6
2	Cano Estancia. . .	2.3	2.3		69.2

Rosario and Peyrano branch.

1	Rosario	0.	0.	via B.A. & R. 303.8 C.Arg. 354.8	22.4
2	Eloy Palacios. . .	7.1	7.1		32.8
3	Soldini.	4.7	11.8		40.
4	Alvarez	13.1	24.9		49.2
5	Acebal.	12.9	37.8		65.8
6	Santa Teresa . . .	22.8	60.6		60.1
7	Peyrano	11.4	72.	B. A. West'n & C.Arg. 282.8 B. A. & Ros. & C. Arg. 375.8	66.8

Cañada de Gómez and Sastre branch.

1	Cañada de Gómez .	0.	0.	West'n. & C.Arg. 380.4 B. A. & Ros. & C. A: 375.9	83.4
2	Elisa.	20.4	20.4		101.7
3	Las Rosas	23.6	44.		96.3

	STATIONS.	DISTANCE IN KILOMETERS. Betwe'n Stations	From Junction.	From Central Buenos Aires	HEIGHT ABOVE SEA LEVEL.
					meters
4	Los Cardos. . . .	18.	62.		108.5
5	El Trébol. . . .	15.7	77.7		92.
6	Pellegrini. . . .	17.	94 7		107.2
7	San Jorge	19.2	113.9		100.
8	Sastre	15.	128.9	West & C. Arg. 509.3 B. A. & Ros. & C. Arg. 504.8	104.7
	Río Segundo and Alta García branch.				
1	Río Segundo . . .			B. A. & Ros. & C. Arg: 662.6 C. Arg: 713.6	342.6
2	Lozalda				377.3
3	Alta García. . . .			B. A. & Ros: & C. Arg: 711.6 C. Arg. 762.6	551.3
	BUENOS AIRES SECTION (FORMERLY "NORTHERN RAILWAY OF BUENOS AIRES".)				
1	Central.	0.	0.		11.3
2	Retiro	1.7	1.7		5.6
3	Recoleta	1.6	3.3		4.7
4	Palermo	2.5	5.8		4.8
5	Arg. Hippodrome .	1.3	7.1		5.
6	Belgrano.	2.5	9.6		6.
7	Nat. Hippodrom . .	1.	10.6		6.
8	Núñez	0.7	11.3		6.1
9	Rivadavia	0.9	12.2		5.9
10	Vicente López. . .	1.9	14.1		5.3
11	Olivos	1.9	16.		6.1
12	Martínez	2.8	18.8		22.6
13	San Isidro	2.4	21.2		19.5
14	Victoria	3.2	24.4		11.6
15	San Fernando. . .	2.2	26.6		6.5
16	Junction				
17	Tigre	3.3	29.9		4.2
	San Fernando Mole line.				
1	Junction	0.	0.		5.5
2	San Fernando Mole	1.8	1.8		4.4

WESTERN SANTA FÉ RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Rosario	From Central Buenos Aires	
					meters.
1	Rosario	0.	0.	Via B. A. and R. 304.5 via B. A. West and C. Arg. 359.1	28.1
2	Bajo Hondo . . .	7.9	7.9		26.
3	Pérez	7.2	15.1		36.
4	Zavalla.	10.7	25.8		49.3
5	Pujato.	15.4	41.2		71.6
6	Villa Casilda . . .	12.5	53.7		75.1
7	Juncture.	3.9	57.6		78.7
8	Palacios	12.2	69.8		93.8
9	Arequitos	14.2	84.		95.
10	S. José de la Esquina	23.4	107.4		82.3
11	Arteaga	8.3	115.7		90.4
12	Juárez Celman . .	9.5	125.2	Via B. A. and R. and W. S. F. R. 129.7 via B. A. W. C. A., and W. S. F. 481.3	77.4

Villa Casilda and Melincué branch.

			From junction		
1	Villa Casilda . . .	0.	0.	B. A. and R. and W. S. F. R. 358.2 Western and C. Arg. 347.1	75.1
2	Juncture.	3.9	3.9		78.7
3	Sanford	11.1	15.		89.7
4	Chabas.	13.4	28.4		97.1
5	Villada.	14.1	42.5		92.
6	Firmat.	13.	55.5		106.3
7	Melincué.	22.4	77.9	B. A. R. and W. S. F. R. 436.1 W. and C. A. 425 W. C. A. and G. S. Santa Fé and Córd. 360.2	89.8

BUENOS AIRES AND ROSARIO RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Between Stations	From Central		
					meters.
1	Central.	0.	0.		11.3
2	Parque 3 de Febrero	6.	6.		4.9
3	Belgrano.	4.5	10.5		15.5
4	Villa Catalinas . .	2.7	13.2		23.8
5	San Martín	4.4	17.6		18.5
6	Bancalari.	12.9	30.5		6.1
7	Pacheco	3.	33.5		6.1
8	Benavidez	8.3	41.8		7.3
9	Escobar	11.7	53.5		24.3
10	Río Luján	11.7	65.2		5.8
11	Otamendi.	6.6	71.8		5.8
12	Campana.	9.6	81.4		5.3
13	Zárate.	12.	93.4		26.6
14	Lima	16.4	109.8		26.7
15	Alsina	24.	133.8		23.9
16	Baradero.	15.2	149.		29.7
17	Tala.	12.9	161.9		24.
18	San Pedro	9.8	171.7		28.
19	Castro	18.3	190.		35.
20	El Paraíso	14.4	204.4		33.7
21	Ramallo	11.	215.4		37.
22	Sánchez	10.6	226.		31.
23	San Nicolás. . . .	12.9	238.9		28.2
24	Villa Constitución Junction. . . .	18.9	257.8		27.2
25	Pavón	1.9	259.7		31.3
26	Arroyo Seco . . .	13.2	272.9		27.
27	Alvear.	15.	287.9		32.8
28	Rosario	15.9	303.8		20.5
29	Alberdi	6.7	310.5		28.8
30	Paganini.	3.3	313.8		31.
31	San Lorenzo . . .	12.8	326.6		30.8
32	Aldao	8.3	334.9		33.
33	Serodino.	16.6	351.5		34.9
34	Carrizales	13.4	364.9		38.3
35	Díaz.	16.4	381.3		38.5

	STATIONS.	DISTANCE IN KILOMETERS.		HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Central	
				meters.
36	Irigoyen	23.4	404.7	41.6
37	Galvez.	16.2	420.9	54.2
38	López	15.7	436.6	56.5
39	Santa Clara. . . .	16.2	452.8	53.7
40	Sá Pereyra. . . .	22.	474.8	64.
41	Aurelia.	17.	491.8	73.8
42	Rafaela	19.6	511.4	99 3
43	Lehmann.	15.2	526.6	95.1
44	Sunchales	19.6	546.2	96.1
45	Las Cadenas . .	2	548.2	96.2
46	Palacios	24.	572.2	95.4
47	Monigotes	24.5	596.7	92.5
48	Arrufo	30.	626.7	91.5
49	Hercilia	27.5	654.2	88.8
50	Ceres	17.	671.2	87.8
51	Selva	16.	687.2	86.1
52	Argentina	33.3	720.5	78.3
53	Malbrán	26.7	747.2	81.9
54	Pinto	31.	778.2	88.
55	Casares.	26.	804.2	94.5
56	Icaño	30.7	834.9	102.5
57	Herrera	28.3	863.2	109.7
58	No Tengo	32.5	895.7	117.9
59	Garza	28.2	923.9	129.1
60	Taboada	25.7	949.6	142.1
61	Fernández	17.5	967.1	153.4
62	Beltrán.	19.4	986.5	168.8
63	La Banda	20.4	1006.9	188.2
64	Ruiz.	31.2	1038.1	268.5
65	Gramilla	30.	1068.1	283.1
66	Suárez.	29.1	1097.2	375.1
67	Sosa.	30.8	1128.	388.8
68	San Miguel. . . .	7.	1135.	
69	Quinteros.	3.9	1138.9	413.1
70	Cruz Alta	8.1	1147.	445.1
71	Tucumán.	8.1	1155.1	447.4

Belgrano and Las Conchas branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters.
1	Belgrano	0.	0.	10.5	15.5
2	Coghlan	0.5	0.5		17.4
3	Saavedra.	1.6	2.1		11.9
4	Florida.	2.7	4.8		20.9
5	B. Mitre	1.9	6.7		17.9
6	Martínez	3.1	9.8		4.5
7	San Isidro	3.9	13.7		4.4
8	Punta Chica . . .	2.1	15.8		4.4
9	San Fernando . . .	3.1	18.9		4.4
10	San Fernando Canal	1.4	20.3		4.4
11	Las Conchas . . .	2.8	23.1	33.6	4.4

San Lorenzo and Cerano Port branch.

1	San Lorenzo . . .	0.	0.	326.6	30.8
2	San Lorenzo Port .	3.3	3.3		23.5
3	Culleu	1.8	5.1		27.9
4	Cerano Port. . . .	1.6	6.7	333.3	22.6

Irigoyen and Santa Fé branch.

1	Irigoyen	0.	0.	404.7	41.6
2	Ledesma	11.3	11.3		31.2
3	Larrechea	16.7	28.		33.5
4	Matilde.	17.2	45.2		32.
5	San Agustín . . .	16.3	61.5		23.8
6	Santo Tomé . . .	10.1	71.6		18.4
7	Santa Fe.	5.2	76.8	Vía B. A. and Rosario 481.5 Vía Galvez and Flores 500.2	16.8

Galvez and Morteros branch.

1	Galvez.	0.	0.	420.9	54.2
2	Wildermuth . . .	19.	19.		53.2
3	Avena	19.	38.		67.1

	STATIONS.	DISTANCE IN KILOMETERS. Between Stations	From Junction	From Central Station	HEIGHT ABOVE SEA LEVEL
					meters.
4	María Juana . . .	21.	59.		104.3
5	Simón Pereyra . .	23.6	82.6		114.4
6	Iturraspe	22.4	105.		114.6
7	Luxardo	15.2	120.2		112.6
8	Freire	16.3	136.5		108.3
9	Porteña	17.	153.5		104.3
10	Brinkman	16.5	170.		101.1
11	Morteros	18.6	188.6	609.5	99.1
	La Banda and Santiago del Estero branch.				
1	La Banda.	0.	0.	1006.9	188.2
2	Santiago del Estero	6.8	6.8	Via B. A. and Rosario 1013.7 Via C. N. 1199.7 Via Córdoba and Rosario 1232.8	185.3

BUENOS AIRES AND PACIFIC RAILWAY.

GUAGE 1.676 M.

			From C. Station		
1	Central.	0.	0.		11.3
2	Palermo	8.1	8.1		6.
3	Devoto.	9.	17.1		24.3
4	Caseros	4.7	21.8		26.3
5	Hurlingham. . . .	6.6	28.4		13.6
6	Bella Vista	3.9	32.3		16.7
7	Muñiz	3.8	36.1		24.9
8	Pilar.	20.8	56.9		24.7
9	Cortinez	30.9	87.8		34.2
10	Agote	15.6	103.4		35.6
11	Mercedes.	9.8	113.2		35.5
12	Franklin	20.	133.2		48.5
13	Rivas	11.2	144.4		50.6
14	Castilla.	13.4	157.8		55.
15	Rawson	15.6	173.4		61.5
16	San Patricio . . .	16.5	189.9		60.
17	Chacabuco	20.8	210.7		69.6

	STATIONS.	DISTANCE IN KILOMETERS. Betwe'n Stations	From C. Station		HEIGHT ABOVE SEA LEVEL
					meters.
18	O'Higgins	21.7	232.4		73.3
19	Junin	23.3	255.7		81.1
20	Arenales	29.2	284.9		80.4
21	Vedia	26.9	311.8		89.4
22	Alberdi	25.7	337.5		94.5
23	Orellanos.	29.8	367.3		112.9
24	Soler	23.1	390.4		106.6
25	Rufino.	32.1	422.5		117.4
26	Salas.	34.6	457.1		127.8
27	Laboulaye	29 6	486.7		137.1
28	Julio A. Roca. . .	32.6	519.3		151.7
29	La Cautiva. . . .	33.9	553.2		191.9
30	Mackenna	28.9	582.1		237.5
31	Washington . . .	27.9	610.		308.4
32	Pannero	31.	641.		379.6
33	Pedernera	28.1	669.1		449.1
34	Villa Mercedes . .	22.2	691.3 Via C. A. and Andine 816.1.		513.6

NATIONAL ANDINE RAILWAY.

GUAGE 1.676 M.

			From Villa Maria		
			—		
1	Villa María. . . .	0.	0.	Via B. A. and P. 646.8 Via C. Arg. 562.1	203.
2	Velez Sarfield. . .	40.	40.		226.5
3	Las Perdices . . .	17.	57.		242.
4	General Cabrera. .	19.	76.		297.
5	Carnerillo.	18.	94.		320.
6	Chucul.	16.	110.		408.3
7	Río Cuarto. . . .	22.	132.		435.3
8	Santa Catalina . .	13.	145.		427.1
9	Sampacho	32.	177.		513.
10	Chajan.	32.	209.		498.5
				Via B. A. and P. 691.3	
11	Villa Mercedes . .	45.	254.	V. B. A. Western, C. Arg. and Andine 816.3	513.6

ARGENTINE GREAT WESTERN RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Villa Mercedes	From Central Station	
					meters
				Via Bs. As. & P. 691.3	
1	Villa Mercedes . .	0.	0.	Via Bs. As. W. Central Argentine and Andine 816.1	513.6
2	Fraga	36.	36.		672.6
3	Alto Grande . . .	24.	60.		640.3
4	San Luis.	35.5	95.5		720.4
5	Baede	29.5	125.		441.
6	Alto Pencoso. . .	35.	160.		623.4
7	Desaguadero . . .	34.	194.		459.
8	La Paz.	22.	216.		494.
9	Tunuyán	40.	256.		563.
10	Santa Rosa. . . .	23.	279.		603.7
11	Alto Verde. . . .	19.	298.		634.
12	Rivadavia	8.	306.		641.
13	San Martín. . . .	6.	312.		649.
14	Palmira	8.	320.		652.
15	Rodeo del Medio .	16.	336.		701.
16	Maipú	8.	344.		749.
17	San Vicente . . .	8.	352.		759.
				Via Bs. As. & P. 1047.3	
18	Mendoza.	4.	356.	Via And'ne route 1172.1	724.2
19	Jocoli	38.	394.		583.
20	Ramblón.	30.	424.		601.
21	Retamito.	23.5	447.5		593.
22	Cañada Honda . .	14.	461.5		591.
23	Pocitos.	34.	495.5		606.
				Via Bs. As. & P. 1204.9	
24	San Juan.	18.	513.5	Via And'ne route 1329.7	638.

VILLA MARÍA AND RUFINO RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Villa María	From Central Station	
					meters
1	Villa María. . . .	0.	0.	Vía Bs. As. & P. 646.8 Vía C. A. 562.1	203.
2	Villa Nueva. . . .	2.6	2.6		202.1
3	Ausonia	24.6	27.2		182.8
4	Etruria.	30.2	57.4		165.2
5	Santa Eufemia . .	24.4	81.8		154.8
6	La Carlota	30.9	112.7		142.4
7	Asunta.	24.9	137.6		130.7
8	La Cesira.	46.9	184.5		123.7
9	Rufino	42.3	226.8	Vía Bs. As & P. 422.5 C. A. 786.4	117.4

VILLA MERCEDES AND LA RIOJA RAILWAY.

GUAGE 1.676 M.

			From Villa Mereedes —		
				Vía Bs. As. & P. 691.3	
1	Villa Mercedes . .	0.	0.	Vía W., C. A. & Andine 716.1 Vía Bs. As. and Rosario, C. A. & Andine 811.6	513.6
2	San José del Morro	57.2	57.2		810.1
3	La Yoma.	29.3	86 5		888.1
4	Renca.	40.7	127.2		772.1
5	Dolores S. Pablo.	27.4	154.6		667.8
6	Santa Rosa. . . .	24.7	179.3		591.4
7	El Salto La Paz.	19.2	198.5		528.1
8	Dolores S. Pedro.	28.1	226.6		514.1
9	San Vicente . .	29.7	256.3		391.1
10	Medanito. . . .	29.4	285.7		286.7
11	Carmen	21.6	307.3		273.6
12	Balde Salado . .	28.1	354.4		282.1
13	Milagro	31.7	367.1		352.1

IN CONSTRUCTION.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Villa Mercedes	From Central Station	
					meters.
14	Alanices	26.6	393.7		371.4
15	Baldes de Pacheco.	17.4	411.1		395.1
16	Chamical. . . .	41.9	453.		466.1
17	Punta de los Llanos	32.4	485.4		387.2
18	Chilca.	35.3	520.7		327.6
19	Quemado . . .	26.9	547.6	Vía Bs. As. & P. 1277.4 Vía Bs. As. and Rosario, C. A. &	331.7
20	La Rioja. . . .	38.5	586.1	Andine 1397.7 1497.7 Vía W. & Andine 1492.2	504.1

IN CONSTRUCTION

GREAT SOUTHERN SANTA FÉ AND CÓRDOBA RAILWAY.

GUAGE 1. 676 M.

			From Villa Constitución		
1	Villa Constitución mole.	0.	0.	Vía B. A. and R. 264.5 vía Western, and C. A. 334.5 vía Western, C. A. and Great Southern of Santa Fé and Córdoba 344.9	22.7
2	Do. do. station	1.	1.		24.2
3	Villa Constitución Junction	5.6	6.6		27.2
4	Godoy.	16.9	23.5		50.6
5	Santa Teresa . . .	27.1	50.6		62.6
6	Paz	16.6	67.2		83.2
7	Alcorta.	16 7	83.9		88.5
8	Carreras	18.6	102.5		99.6

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Between Stations	From Villa Constitucion	From Central Station	
9	San Urbano (Melincué).	14.1	116.6		meters 90.8
10	Flortondo.	16.8	133.4		103.3
11	San Jorge	13.9	147.3		105.6
12	Venado Tuerto	18.7	166.		114.1
13	San Eduardo	10.5	176.5		111.5
14	Maggiolo.	18.3	194.8		117.6
15	Arias	17.6	212.4		123.
16	Alejo Ledesma	20.7	233.1		128.
17	Canals.	24.8	257.9		122.
18	Vázquez	12.3	270.2		121.8
19	Olmos	12.2	282.4		120.7
20	La Carlota	17.8	300.2	Vía B. A. and R. and G. S. Santa Fé and Córdoba 564.8 vía B. A. and P. 534.1 vía Western Central Arg. and G. S. Santa Fé & Córd: 543.8	142.5

BAHÍA BLANCA NORTH WESTERN RAILWAY.

GUAGE 1.676 M.

			From Bahia Blanca —		
1	Junction with B. A. G. Southern	0.	0.	Vía B. A. A. Southern 707.7	13.
2	Bahia Blanca.	3.3	3.3		21.5
3	Villa Olga	10.2	13.5		10.2
4	Nueva Roma	29.	42.5		73.5
5	Berraondo	22.9	65.4		139.3
6	Adolfo Alsina.	43.4	108.8		199.1
7	Jacinto Araoz.	32.4	141.2		161.7
8	Bernasconi	34.4	175.6		162.2
9	Ramón Blanco	29.8	205.4		136.9
10	Epupel.	36.8	242.2		176.8
11	General Acha. (In construction.)	40.8	283.	Vía B. A. G. S. and B. B. N. Western 990.7	220.6

TRANSANDINE RAILWAY.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Mendoza	From Central Station	
					meters.
1	Mendoza	0.	0.	Vía Bs. As. & P. 1047.3 Vía And'ne route 1172.1	724.7
2	Compuerta	22.	22.		1019.
3	Cachenta.	16.7	38.7		1198.3
4	Guido	26.3	65.		1436.1
5	Uspallata.	27.7	92.7		1718.6
6	Río Blanco. . . .	19.3	112.		1980.6
7	Punta de las Vacas.	30.7	142.7		2358.9
8	Puente del Inca. .	15.	157.7		2635.5
9	Argentine Frontier.	15.8	173.5	Vía Bs. As. & P. 1220.8 Vía And'ne route 1345.6	3189.1

CÓRDOBA CENTRAL RAILWAY.

GUAGE 1 METER.

			From Córdoba		
1	Córdoba junction with Central Northern. . . .	0.	0.	Vía Córdoba and Rosario and Central Córdoba 732.3 vía C. A. 702.1 vía C. A. and C. Córd: 753.9	427.
2	Alta Córdoba . . .	1.1	1.1		421.8
3	Constitución . . .	22.4	23.5		350.8
4	Piquilín	18.5	42.		292.6
5	Río Primero . . .	14.	56.		252.4
6	Santiago Temple .	22.1	78.1		213.
7	Tránsito	20.9	99.		174.5
8	Arroyito	14.2	113.2		149.1

	STATIONS.	DISTANCE IN KILOMETERS. Betw'en Stations	From Córdoba	From Central Station	HEIGHT ABOVE SEA LEVEL
					meters.
9	El Tio.	22.3	135.5		128.2
10	La Francia. . . .	18.5	154.		111.7
11	Devoto.	31.	185.		112.6
12	San Francisco. . .	22.9	207.9	Vía Córdoba and Rosario, and Central Córdoba 522.3 vía C. A. 912.1 vía and C. Córdoba 543.9 B. A. & Rosario	116.5
13	Frontera	2.1	210.		116.2

CÓRDOBA AND ROSARIO RAILWAY.

GUAGE 1 METER.

			From Frontera —		
1	Frontera	0.	0.	Vía B. A. and R. & C. Córd: 543.9	216.2
2	Esmeralda	21.	21.		115.2
3	Sastre	18.1	39.1		104.7
4	Traill	19.	58.1		79.3
5	Armstrong	21.	79.1		75.8
6	Castro	18.9	98.		60.3
7	Centeno	13.6	111.6		66.3
8	San Genaro. . . .	9.5	121.1		63.
9	Larguia	23.9	145.		60.7
10	Froilán Palacios. .	17.8	162.8		50.7
11	Luis Palacios. . .	21.4	184.2		27.7
12	Alberdi.	19.5	203.7		2.6
13	Rosario	14.7	218.4	Vía B. A. and R. 301 vía C. Arg. 354	31.5

Rafaela and Frontera de Córdoba branch.

1	Frontera	0.	0.	Vía B. A. and R. & Córdoba & R. 522.3	
2	Santa Clara. . . .	22.8	22.8		
3	Saguier	13.2	36.		
4	Rafaela	24.	60.	Vía B. A. and R. and Córd: and R. 582.3 vía B. A. and R. 511.4	1. 00

CENTRAL CÓRDOBA RAILWAY.

(Central Northern Section.)

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Córdoba	From Central Station	
					meters.
1	Córdoba	0.	0.	Vía B. A. and R and C. A. 699.2 vía B. A. and R., C. and R., and C. Córdoba 732.3 vía Western, and C. Arg. 758.4	389.4
2	Alta Córdoba . . .	4.	4.		421.8
3	Juárez Celman . .	15.	19.		498.7
4	General Paz . . .	14.	33.		530.4
5	Jesús María. . . .	18.	51.		539.5
6	Sarmiento	23.2	74.2		620.7
7	Avellaneda	22.	96.2		706.7
8	Dean Funes. . . .	24.6	120.8		692.7
9	Quilino.	27.4	148.2		396.2
10	San José.	25.8	174.		197.4
11	Yotoralejos. . . .	48.	222.		176.9
12	Recreo.	44.3	226.3		219.2
13	San Antonio . . .	38.7	305.		267.3
14	Frias	33.5	338.5		328.1
15	Iriondo.	26.2	364.7		425.1
16	Lavalle.	23.1	387.8		577.6
17	San Pedro	27.2	415.		376.6
18	La Madrid	35.	450.		287.3
19	Monteagudo. . . .	15.7	465.7		295.3
20	Simoca.	29 3	495.		316.9
21	Bella Vista. . . .	27.	522.		258.3
22	Río Luiess	9.	531.		375.4
23	San Felipe	9.	540.		395.3
24	Tucumán.	7.	547.	Vía. B. A. & R. 1156.8 V. S. Cristobal 1261.9 Via B. A. & R. Córd. & Ros. & Central Córd. 1305.4 Via Central Arg. & B. A. & R. 1246.2	436.4

Recreo and Chumbicha branch.

	STATIONS.	DISTANCE IN KILOMETERS. Betwe'n Stations	From Junction	From Central Station	HEIGHT ABOVE SEA LEVEL
					meters.
1	Recreo.	0.	0.	Vía C. A. and B. A. and R. 965.5 vía B. A. and R. Córd: and R. and Central Córdoba 998.6 vía Western and C. A. 1024.7	219.2
2	Esquiú.	27.	27.		243.2
3	La Guardia. . . .	26.	53.		229.2
4	Telaritos.	28.	81.		233.3
5	San Martín. . . .	32.	113.		271.2
6	San Ignacio. . . .	32.	145.		305.4
7	Chumbicha. . . .	31.	176.	Vía B. A. and R. and C. A. 1141.5 vía do, C. and R. C. C. 1174.6 vía W. C. A. 1200.7	415.2

Frias and Santiago del Estero branch.

1	Frías	0.	0.	Vía B. A. and R., C. Arg. 1037 vía B. A. and R., C. and R., C. C. 1078 vía Western C. Arg. 1096, vía B. A. and R. 1175	328.1
2	Choya.	32.	32.		381.3
3	Laprida	37.	69.		208.3
4	Loreto.	35.	104.		139.5
5	Simbol.	23.	127.		165.3
6	Sanjón.	20.	147.		176.6
7	Santiago del Estero	15.	162.	Vía B. A. and R. C. Arg. 1199.7 vía B. A. and R. C. and R. C. C. 1238 vía B. A. and R. 1013.7	187.3

CÓRDOBA NORTH-WESTERN RAILWAY.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Córdoba	From Central Station	
					meters.
1	Junction with Central Córdoba . .	0.	0.	Vía Córdoba and R.—C. Córd. 732 vía C. A. 706.5 vía C. A.—C. Córdoba 753.5	420.3
2	Alta Córdoba. . .	0.7	0·7		421.8
3	Rodríguez del Busto	5.3	6.		450.7
4	Argüello	4.4	10.4		467.2
5	La Calera.	11.3	21.7		544.7
6	Río Primero . . .	12.3	34.		569.7
7	San Roque	10.5	44.5		657.7
8	Santa María . . .	4.7	49.2		665.7
9	Cosquín	8.2	57.4		721.7
10	Casa Grande . . .	12.6	70.		813.7
11	Huerta Grande . .	10.8	80.8		983.7
12	San Gerónimo . .	12.6	93.4		1156.6
13	San Ignacio . . .	9.6	103.		1029.7
14	Capilla del Monte.	7.2	110.2		994.2
15	Carreras de Pun-Pun	11.	121.2		365.2
16	Los Sauces. . . .	18.	139.2		593.2
17	Cruz del Eje . . .	11.	150.2		489.7
18	Junction with Dean Funes and Chilecito line	3.	153.2	Vía Córd. and R.—C. Córd. 885.1 vía C. Arg. 859.7 vía C. Arg.—C. Córd. 906.7	480.7

DEAN FUNES AND CHILECITO NATIONAL RAILWAY.

GUAGE 1 METER.

			From Dean Funes		
1	Dean Funes . . .	0.	0.	Via B. A. and R. C. A. 820 vía B. A. and R. C. and R. and C. C. 853.1 vía W. and C. A. 879	692.7
2	Santo Domingo . .	33.4	33.4		497.7
3	Cruz del Eje . . .	31.5	64.9		480.7

	STATIONS.	DISTANCE IN KILOMETERS. Between Stations	From Dean Funes	From Central Station	HEIGHT ABOVE SEA LEVEL
					meters.
4	Bañada de Soto. .	24.8	89.7		482.3
5	Pozo Viejo	12.5	102.2		413.
6	Tuelame	6.	108.2		384.3
7	Pumfa de la Serrezuela.	18.9	127.1		281.6
8	San Francisco. . .	33.7	160.8		255.6
9	Chañar.	22.2	183.		328.7
10	Chamical	39.9	222 9		467.2
11	Punta de los Llanos	31.8	254.7		393.1
12	Padguia	34.9	289.6		430.7
13	Los Colorados. . .	29.3	318.9		648.8
14	La Ramada. . . .	34.8	353.7		724.4
15	Bichigast	26.6	380.3		840.2
16	Nonogasta	20.8	401.1		930.
17	Chilecito	13.5	414.6	Via B. A. and R. C. A. 1234 B. A. and R. C. and R. C. C. 1267.7 vía W. and C. A. 1294	1070.3

IN CONSTRUCTION.

CHUMBICHA AND CATAMARCA RAILWAY.

GUAGE 1 METER.

			From Chumbicha		
1	Chumbicha. . . .	0.	0.	Vía B. A. and R. C. A. and C. N. 1141.5 vía B. A. and R. Córd. and R. C. C., Central Norte 1147.6 vía W. C. A., C. C. C. Norte 1200.7	415.2
2	Capayan	21.2	21.2		412.7
3	Villa Prima. . . .	8.8	30.		440.9
4	Miraflores	18.	48.		519.9
5	Catamarca	18.	66.	Vía B. A. and R. C. Arg. 1207.5 vía B. A. and R., Córd. and R. C. Córd. 1240.6 vía W. C. A., C. Norte 1266.7	509.2

CENTRAL NORTHERN PROLONGATION RAILWAY.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Between Stations	From Tucumán	From Central Station	
					meters.
1	Tucumán.	0.	0.	Via B. A. and R. C. A. 1246 via B. A. and R. C. and R., C. C. 1279 3 via W. and C. A. 13054.	436.4
2	Tafi viejo	14.5	14.5		603.5
3	Tapia	17.5	32.		685.3
4	Vipos	15.	47.		782.1
5	Alurralde.	14.5	61.5		761.5
6	Trancas	15.5	77.		777.5
7	Tala.	15.	92.		811.
8	Arenal.	27.	119.		915.9
9	Rosario de la frontera	22.	141.		783.7
10	Metan	37.	178.		852.2
11	Las Piedras. . . .	25.	203.		718.8
12	Chilcas.	23.	226.		689.8
13	Las Palomitas . .	32.	258.		860.9
14	Cabeza del Buey .	14.7	272.7		744.8
15	General Güemes .	15.3	288.		718.7
16	Pampa blanca. . .	16.	304.		741.
17	Perico	20.	324.		941.8
18	Palpalá	16.	340.		1090.5
19	Jujuy	12.3	352.3	Via B. A. and R. C. A. 1601 Via B. A. and R. C. and R. 1634 Via Western and C. A. 1660 Via B. A. and R. 1511 Via San Cristobal 1616	1222.5

General Güemes and Salta Branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL.
		Betwe'n Stations	From G. Guemes	From Central Station	
					meters.
1	General Güemes .	0.	0.	Via B. A. and R. C. A. 1535 Via B. A. and R. C. and R. 1568 Via Western and C. A. 1594 Via B. A. and R. 1415	718.7
2	Campo Santo . . .	7.3	7.3		785.2
3	Mojotoro	19.1	26.4		1047.6
4	Salta.	19.1	45.5	Via B. A. and R. C. A. 1580 Via B. A. and R. C. and R. 1613 Via Western and C. A. 1639 Via B. A. and R. 1491	1171.1

ARGENTINE NORTH WESTERN RAILWAY.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From La Madrid	From Central Station	
					meters.
1	La Madrid	0.	0.	Vía B. A. and R. C. A. 1149 Vía B. A. and R. C. and R. 1182 Vía Western C. A. 1208	287.3
	Higueritas, stopping place.	11.	11.		300.1
2	Graneros.	8.5	19.5		318.1
	Campobello, stopping place . . .	9.5	29.		343.2
3	Villa Alberdi . . .	11.	40.		367.7
4	San Francisco. . .	7.	47.		365.8
5	Rio Chico.	6.	53.		
6	Aguilares.	4.	57.		370.5
7	Azucarera Argentina.	6.5	63.5		371.
8	Concepción. . . .	4.5	68.		364.5
9	Arcadia	5.	73.		366.3
10	Rio Seco.	6.	79.		368.6
11	Villa Quinteros . .	3.	82.		
12	Santa Rosa. . . .	2.4	84.4		362.8
13	Monteros.	5.3	89.7		348.8
	Acheral, stopping place.	8.3	98.		352.1
14	Famaillá	7.6	105.6		358.4
15	Monte Grande. . .	4.8	110.4		367.4
16	La Reducción. . .	7.8	118.2		390.8
17	Lules	3.8	122.		413.3
18	Ingenio Lules. . .	2.	124.		
19	San Pablo	5.	129.		410.6
20	Manantial	4.	133.		411.8
21	Tucumán.	7.4	140.4	Vía B. A. and R. C. A. 1280 Vía B. A. and R. C. and R. 1322 Vía W. C. A. 1348 Vía B. A. and R. 1156	422.6

Concepción and Medinas branch.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Concepción	From Central Station	
					meters.
1	Concepción	0.	0.	Vía B. A. and R. C. A. 1217	364.5
2	Medinas	11.8	11.8	Vía B. A. and R. C. and R. 1229	348.8

Córdoba and Malagueña Railway.

			From Córdoba		
1	Córdoba	0.	0.		390.4
2	Malagueña	26.2	26.2		529.2

SANTA FÉ PROVINCIAL RAILWAYS.

Santa Fé and San Cristobal line.

GUAGE 1 METER.

			From Santa Fe		
1	Santa Fé.	0.	0.	Vía B. A. and R. C. A. 481.5 Vía B. A. and R. Santa Fe Prov. 516 Vía B. A. and R. (Sta. Fé branch) 460	16.8
2	Flores	7.	7.		19.
3	S. Carlos Junction.	9.4	16.4		19.3
4	Esperanza	15.6	32.		39.5
5	Humboldt	15.	47.		54.7
6	Pilar.	16.2	63.2		60.9
7	Aurelia.	12.1	75.3		66.
8	Rafaela.	17.7	93.		100.
9	Lehman	14.	107.		89.9
10	Ataliva	14.6	121.6		84.9
11	Humberto 1.º. . .	15.6	137.2		83.5
12	Constanza	22.9	160.1		80.6

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Santa Fé	From Central Station	
					meters.
13	Capivara	22.5	182.6	Vía B. A. and R. 681	75.4
14	San Cristobal. . .	16.9	199.5	Vía B. A. and R. Sta Fé Prov. 617 Vía B. A. and R. (Sta. Fé branch) 660	75.8

Humboldt and Soledad line.

			From Humboldt		
1	Humboldt	0.	0.	Vía B. A. and R. Sta. Fé Prov. 528 Vía B. A. and R. (Sta. Fé branch) 507	54.7
2	Grutli	18.6	18.6		41.9
3	Progreso.	15.4	34.		51.9
4	Providencia. . . .	15.8	49.8		54.1
5	La Pelada	13.5	63.3		53.8
6	Soledad	30.4	93.7	Vía B. A. and R. Sta. Fé Prov. 622 Vía B. A. and R. (Sta. Fé branch) 601	57.3

San Carlos junction to Galvez branch.

			From junction		
1	San Carlos Junction	0.	0.	Vía B. A. and R. Sta. Fé Prov. 502	19.3
2	Zavalla.	6.9	6.9		31.3
3	Franck.	6.8	13.7		41.8
4	Las Tunas	5.6	19.3		40.8
5	San Carlos, North .	15.7	35.		46.5
6	" " Centre.	6.2	41.2		43.3
7	" " South .	4.1	45.3		41.9
8	Gessler.	13.9	59.2		44.8
9	Loma Alta	9.8	69.		55.
10	Galvez	10.3	79.3	Vía B. A. and R. Sta. Fé Prov. 420	55.3

Gessler and Coronda line.

STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
	Betwe'n Stations	From Junction	From Central Station	
				meters.
			Vía B. A. and R. Sta. Fé Prov. 442	
1 Gessler.	0.	0.	Vía B. A. and R. (Sta. Fé branch) 460	44.8
2 Oroño	5.4	5.4		40.8
			Vía B. A. and R. Sta. Fé Prov. 465	
3 Coronda	18.2	23.6	Vía B. A. and R. (Sta. Fé branch) 484	18.3

Pilar and Córdoba frontier line.

			Vía B. A. and R. Sta. Fé Prov. 544	
1 Pilar.	0.	0.	Vía B. A. and R. (Sta. Fé branch) 524	60.9
2 Angelica	30.4	30.4		78.3
3 Clucellas	16.6	47.		97.3
4 Josefina	31.	78.		114.1
			Vía B. A. and R. Sta. Fé Prov. 626	
5 Córdoba frontier. .	13.8	81.8	Vía B. A. and R. (Sta. Fé branch) 605	116.2
			Vía B. A. and R. Cór. and R. 522	

Santa Fé and Colastiné Branch.

			Vía B. A. and R. 481	
1 Santa Fé.	0.	0.	Vía B. A. and R. (Sta. Fé branch) 461	16.8
2 Guardia	2.	2.		14.
			Vía B. A. and R. 492	
3 Colastiné.	9.	11.	Vía B. A. and R. (Sta. Fé branch) 472	14.7

Colastiné and San José del Rincón branch.

STATIONS.	DISTANCE IN KILOMETERS. Betwe'n Stations	From Junction	From Central Station	HEIGHT ABOVE SEA LEVEL.
				meters.
1 Colastiné.	0.	0.	Via B. A. and R. 492.5 Via B. A. and R. (Sta. Fé branch) 471.8	14.7
2 San José.	6.3	6 3		16.2

Santa Fé and Reconquista line.

1 Santa Fé.	0.	0.	Via B. A. and R. 481.5 Via B. A. and R (Sta. Fé branch) 460 Via B. A. and R. Sta. Fé Prov. 516	16.8
2 Recreo.	17.5	17.5		24.1
3 Iriondo.	20.	37.5		24.3
4 Galvey's siding . .	5.8	43.3		29.9
5 Lassaga	8.2	51.5		45.3
6 Cabal	9.7	61.2		47.6
7 Emilio.	4.6	65.8		47.6
8 Videla.	14.4	80.2		45.1
9 San Justo	18 7	98.9		56.2
10 Ramayón.	15.3	114.2		56.3
11 Escalada	10.8	125.		56.3
12 Siding.	15.	140.		56.
13 Crespo.	10.	150.		55.1
14 Fives Lille	25.	175.		56.2
15 Siding.	12.	187.		55.9
16 Siding.	10.	197.		55.3
17 Calchaquí.	6.6	203.6		57.
18 Margarita.	21.9	225.5		59.6
19 Espin	17.4	242.9		59.6
20 Vera.	7.6	250.5		58.1
21 Caraguatay. . . .	10.5	261.		58.2
22 Malabrigo	18.8	279.8		55.6

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Between Stations	From Junction	From Central Station	
					meters.
23	Berna	13.2	293.	Vía B. A. and R. 799.3	49.9
24	Reconquista . . .	24.8	317.8	Vía B. A. and R. Sta. Fé Prov. 831 Vía B. A. and R (Sta. Fé branch) 778	43.3

Manuel Galvez and San Cristobal line.

1	Manuel Galvez . .	0.	0.	Vía B. A. and R Sta. Fé Prov. 524 Vía B. A. and R. (Sta. Fé branch) 504	29.9
2	Los Leones. . . .	12.6	12.6		35.5
3	María Luisa. . . .	21.8	34.4		51.8
4	La Pelada	16.8	51.2		52.1
5	Eliza.	20.8	72.		55.5
6	Clara	20.9	92.9		65.8
7	San Cristobal . . .	26.3	119.2	Vía B. A. and R. Sta. Fé Prov. 644 Vía B. A. and R. (Sta. Fé branch) 580	81.2

Santa Fé and Rosario line.

1	Santa Fé.	0.	0.	Vía B. A. and R. Sta. Fé Prov. 460	16.8
2	Santo Tomé. . . .	11.	11.		17.1
3	Sauce Viejo. . . .	11.7	22.7		15.4
4	Coronada.	23.8	46.5		15.2
5	Aspeadero	0.9	47.4		15.1
6	Arozena	14.6	62.		18.7
7	Joaquina.	7.	69.		21.7
8	La Barranca . . .	10.3	79.3		24.9
9	Maciel	27.	106.3		18.2

Maciel and Port Gaboto branch.

	STATIONS.	DISTANCE IN KILOMETERS. Between Stations	From Junction	From Central Station	HEIGHT ABOVE SEA LEVEL
					meters.
1	Maciel	0.	0.	Via B. A. and R. Sta. Fé Prov. 354	18.2
2	Port Gaboto . . .	7.9	7.9		12.

SAN CRISTOBAL AND TUCUMÁN RAILWAY.

GUAGE 1 METER.

			From S. Cristóbal		
1	San Cristóbal. . .	0.	0.	Via B. A. and R. S. Fé Prov. from Rafaela 617.9 Via B. A. and R. (Sta. Fé branch) 660 Via B. A. and R. S. Fé Prov. from Pilar 681	75.9
2	La Cabral	24.6	24.6		68.8
3	Fas Avispas . . .	24.4	49.		64.8
4	Estevan Ramos. .	23.6	72.6		68.1
5	Portalis	37.6	110.2		73.
6	Fort Tostado. . .	30.9	141.1		75.8
7	Fort Inea	20.1	161.2		80.6
8	Guardia Escolta. .	23.8	185.		85.9
9	Bandera	18.	203.		91.5
10	Averías	24.	227.		100.
11	Tacañitas.	20.	247.	Via B. A. and R. (Sta. Fé branch) 962	105.8
12	Antuya	23.	270.	Via B. A. and R.	
13	Fort Melero . . .	32.	302.	S. Fé Prov. from Rafaela 919.9	
14	Matará.	27.	329.	Via B. A and R.	
15	Suncho Corral . .	31.	360.	S. Fé Prov. from Pilar 983	

OCAMPO AND PARANÁ PORT LINE.

GUAGE 1 METER.

STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
	Betwe'n Stations	From Ocampo	From Central Station	
				meters.
1 Ingenio Ocampo. .	0.	0.	Via B. A. and R. Sta. Fé and Reconquista 878.2	54.3
2 Adela	0.8	0.8		54.1
3 Ocampo	6.1	6.9		53.3
4 Villa Vicente. . .	6.	12.9		54.1
5 Port Vicente . . .	4.4	17.3		49.
6 Paraná Port . . .	22.5	39.8	Via B. A. and R. Sta. Fé and Reconquista, Ocampo and P. 904	47.9

FLORENCIA PLANTATION AND PORT LINE.

GUAGE 1 METER.

		From Plantation		
1 Florencia plantation	0.	0.	Via B. A. and R. Sta. Fé and Reconquista 940.1	59.
2 Florencia.	16.4	16.4		57.3
3 Port Florencia . .	5.5	21.9	Via B. A. and R. Sta. Fé and Reconquista 961.2	52.2

ENTRE RÍOS RAILWAYS.

Main Line.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS. Between Stations	From L. Paraná	From Central Station	HEIGHT ABOVE SEA LEVEL
					meters.
1	Lower Paraná . .	0.	0.	Vía B. A. and R. Colastiné 498 Vía B. A. and R. (Sta. Fé branch) 478	18.6
2	Paraná.	6.5	6.5		67.7
3	Juárez Celman . .	15.8	22.3		113.6
4	Racedo.	17.3	39.6		114.7
5	Crespo.	13.9	53.5		116.8
6	Ramírez	20.8	74.3		118.3
7	Hernández	27.4	101.7		99.1
8	Nogoyá	25.1	126.8		46.1
9	Lucas Gonsález. .	26.	152 8		85.8
10	Sola.	20.9	173.7		84.5
11	Tala.	22.	195.7		34.
12	Rocamora	17.	212.7		44.6
13	Basabilbaso. . . .	10.1	222.8		53.7
14	1.º de Mayo . . .	12.2	235.		58.2
15	Caseros	26.7	261.7		53.5
16	Uruguay.	24.8	286.5		20.1
17	Uruguay National wharf	3.	289.5	Vía B. A. and R. Colastiné 788 Vía B. A. and R. (Sta. Fé branch) and C. Entre Ríos 767.3	16.1

Nogoyá and Port Victoria branch.

		From Junction			
1	Nogoyá	0.	0.	Vía B. A. and R. Colastiné 625 Vía B. A. and R. (Sta. Fé branch) and C. Entre Ríos 604	46.1

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters.
2	Gobernador Febre.	16.2	16.2		88.5
3	" Antelo.	13.4	29.6		60.5
4	Victoria	19.6	49.2		8.2
				Vía B. A. and R. Colastiné. C. E. R. 676	
5	Port Victoria. . .	2.3	51.5	B. A. and R. Santa Fé branch C. E. R. 656	5.2

Tala and Gualeguay branch.

				Vía Buenos Aires and Rosario Colastiné 697	
1	Tala.			Via Buenos Aires and R. Santa Fé branch 673	
2	Gobernador Echagüe				
3	General Mansilla. .				
4	" Galarza . .				
5	" Basabilbaso				
				Vía Buenos Aires and Rosario Colastiné 867	
6	Gualeguay			Vía Buenos Aires and R. Santa Fé branch 784	

Basabilbaso and Gualeguaychú branch.

				Vía Buenos Aires and Rosario Colastiné C. E. R. 721	
1	Basabilbaso. . . .			Vía Buenos Aires R. Santa Fé branch 701	53.7

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Junction	From Central Station	
					meters.
2	Toreuato Gilbert .	29.9	20.9		66.8
3	General Urdinaraim	20.3	41.2		97.6
4	" Almada. .	20.4	61.6		41.8
5	" Palavecino.	21.8	83.4		20.7
				Vía B. A. and R. Colastiné 821	
6	Gualeguaychú. . .	16.3	99.7	Vía B. A. and R. (Sta. Fé branch) 809	10.8

Basabilbaso and Villaguay branch.

				Vía B. A. and R. Colastiné C. E. R. 721	
1	Basabilbaso. . . .			Vía B. A. and R. (Sta. Fé branch) 701	53.7
2	Gobernador Urquiza				
3	Gobernador Domínguez.				
				Vía B. A. and R. Colastiné 783	
4	Villaguay.			Vía B. A. and R. (Sta. Fé branch) 762	

ARGENTINE NORTH EASTERN RAILWAY.

GUAGE 1.676 M.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	From Caseros	From Central Station	
					meters.
1	Monte Caseros. . .	0.	0.	Via B. A. R. Colastiné C. E. R. East Argentine 1065. Via B. A. R. Santa Fé branch C. Entre-Rios East Arg. 1045.	67.1
2	Libertad	34.8	34.8		101.
3	Curuyú Cuatiá . .	30.6	65.4		86.5
4	Baibene	23.8	89.2		115.7
5	Justino Solari. . .	26.	115.2		135.1
6	Mercedes.	25.3	140.5		112.6
7	Felipe Jofré . .	27.1	167.6		90.6
8	J. M. Chavarría	28.8	196.4		75.5
9	San Diego . . .	23.	219.4		84.5
10	San Roque. . .	20.6	240.		78.3
11	Saladas	36.6	276.6		84.
12	San Lorenzo . .	19.2	295.8		78.
13	Empedrado. . .	21.4	317.2		83.5
14	Manuel Derqui.	14.8	332.		75.8
15	Riachuelo . . .	27.	359.		75.1
16	Corrientes . . .	15.	374.		76.2
	IN CONSTRUCTION.				
17	Bajada.	3.	377.	Vía Bs. As. and Rosario Colastiné C.E.R. East Argentine N. E. R. 1442 Vía Bs. As. R. Santa Fé branch etc. 1421.6	60.7

PRIMER ENTRERIANO LINE.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.			HEIGHT ABOVE SEA LEVEL
		Betwe'n Stations	Total length	From Central Station	
					meters.
1	Gualeguay	0.	0.	Vía B. A. and R. Colastiné C. E. R. 804.5 Vía B. A. and R. (Sta. Fé branch) C. E. R. 784	13.3
2	Port Ruiz	9.6	9.6		12.3

EAST ARGENTINE RAILWAY.

GUAGE 1 METER.

			From Concordia		
1	Concordia	0.	0.	Vía B. A. and R. Colastiné C. E. R. 911 Vía B. A. and R. (Sta. Fé branch) C. E. R. 890	42.1
2	Gualeguaycito. . .	29.2	29.2		52.1
3	Federación	25.8	55.		57.4
4	Santa Aua	11.	66.		52.9
5	Chajari.	17.5	83.5		78.6
6	Mocaretá.	15.5	99.		68.4
7	Naranjito.	25.2	124.3		75.1
8	Monte Caseros. . .	30.1	154.2		67.1
9	Ceibo	5.7	160.	Vía B. A. and R. Colastiné C. E. R. East Arg. 1071 Vía B. A. and R. (Sta. Fé branch) C. E. R. E. Arg. 1050	67.6

CHUBUT CENTRAL RAILWAY.

GUAGE 1 METER.

	STATIONS.	DISTANCE IN KILOMETERS.		HEIGHT ABOVE SEA LEVEL
		Betw'en Stations	From Port Madryn	
1	Port Madryn . . .	0.	0.	9.4
2	Hin Araon	22.4	22.4	125.3
3	Frelew.	47.5	69.9	26.9

RESUMEN.

RAILWAY.	LENGTH IN KILOMETERS OF EACH SECTION.
Western of Buenos Aires.	
Main line from Once de Setiembre to Trenque-Lauquen	443.300
Branch from Once de Setiembre to Catalinas.	6.000
" " " " " to Prod. Market.	13.000
" " Haedo to La Plata.	70.300
" " La Plata to River Santiago	10.600
" " Tolosa to Pereyra Junctn.	6.500
" " Tolosa to Elizalde.	11.000
" " Pereyra Junctn. to Pereyra	2.000
" " Marmol to Temperley.	2.100
Total length of line.	564.800
Southern Railway.	
Main line to Port of Bahía Blanca	716.700
Branch from Lanus Junctn. to the Boca	5.800
" " Temperley to Cañuelas	47.500
" " Altamirano to Bahía Blanca port.	643.000
" " Maipú to Mar del Plata	131.000
" " Hinojo to Sierra Baja	5.500
" " Hinojo to Sierra Chica	7.700
" " Olavarria to Estancia Dávila	13.000
" " Tandil to Las Canteras	5.300
" " Merlo to Saladillo.	151.400
" " Las Flores to Tandil.	151.200
Total length of line.	1878.100
Buenos Aires and Ensenada.	
Main line	59.900
Branch from Ringuelet to Ferrari	38.500
" " Elizalde to Magdalena.	47.200
Total length of line.	145.600

RAILWAY.	LENGTH IN KILOMETERS OF EACH SECTION.
Central Argentine Railway.	
Main line from Rosario to Córdoba	395.400
Branch from Luján to Cañada de Gómez . . .	305.400
" " Rosario to Peyrano.	72.000
" " Pergamino to San Nicolás . . .	76.000
" " Pergamino to Junín	89.000
" " Cano to Estancia Cano	2.300
" " Cañada de Gómez to Sastre . . .	128.900
" " Río Segundo to Alta Gracia. . .	49.000
Buenos Aires Section (formerly Nortern Railway).	
Branch from Central to the Tigre	29.900
" " Junction to San Fernando mole. .	1.800
Total length of line	1149 800
Western of Santa Fé.	
Main line from Rosario to Juárez Celman . .	128.200
Branch from Villa Casilda to Melincué . . .	77.900
Total length of line	206.100
Buenos Aires and Rosario.	
Main line from Buenos Aires to Tucumán . .	1155.100
Branch from Belgrano to Las Conchas . . .	23.100
" " San Lorenzo to Cerano Port. . .	6.700
" " Irigoyen to Santa Fé.	76.800
" " Galvez to Morteros	88.600
" " La Banda to Santiago del Estero .	6.800
Total length of line	1457.100
Buenos Aires and Pacific.	
Main line from Buenos Aires co Villa Mercedes (San Luis)	691.300
Andine Railway.	
From Villa María to Villa Mercedes	254.000

RAILWAY.	LENGTH IN KILOMETERS OF EACH SECTION.
Great West Argentine.	
Main line from Villa Mercedes to Mendoza. .	356.000
From Mendoza to San Juan	157.500
Total length of line, ...	513.500
Transandini Railway.	
From Mendoza to the Argentine and Chilián Frontier.	173.500
Villa María and Rufino	226.840
Nort-West Argentine.	
From Villa Mercedes to Rioja.	86.500
Great Southern of Santa Fé and Córdoba.	
From Villa Constitución mole to Carlota. . .	300.200
Bahía Blanca and Northwestern.	
From Junction with Southern Railway to Epupel.	242.200
Central Córdoba Railway.	
From the Junction with the Central Northern Railway (Córdoba) to the Frontier. . . .	210.000
Córdoba and Rosario.	
Main line from Rosario to the Frontier . . .	218.400
Branch from the Cordobés frontier de Rafaela .	60.000
Total length of line	278.400
Central Córdoba Railway (Northern Section).	
Main line from Córdoba to Tucumán. . . .	547.000
Branch from Recreo to Chumbicha.	176.000
" " Frías to Santiago del Estero. . .	162.000
Total length of line	885.000

RAILWAY.	LENGTH IN KILOMETERS OF EACH SECTION.
Central Córdoba and Northwestern.	
From the Central Córdoba Railway junction to the junction with the Dean Funes and Chilecito Railway.	153.200
Dean Funes and Chilecito Bly.	
From Dean Funes to Padquia	289.600
Chumbicha and Catamarca. . . .	66.000
Central Northern.	
From Tucumán to Jujuy.	352.300
Branch from General Güemes to Salta . . .	45.000
Total length of line.	397.800
North West Argentine.	
Main line from La Madrid to Tucumán . . .	140.400
Branch from Concepción to Medinas	11.800
Total length line	152.200
Malagueña Railway.	
Córdoba to Malagueña	26.200
Railways of the Province of Santa Fé.	
Main line from Santa Fé to San Cristóbal . .	199.500
Branch from Humboldt to Soledad.	93.700
" " San Carlos Junction to Galvez . .	79.300
" " Gessler to Coronda.	23.600
" " Pilar to the Córdoba frontier. . .	81.000
Line " Santa Fé to Colastiné.	11.000
Branch " Colastiné to San José del Rincón. .	6.300
Line " Santa Fé to Reconquista	317.800
Branch " Manuel Galvez to San Cristóbal . .	119.200
Line from Santa Fé to Rosario (as far as Maciel).	106.300
Branch " Maciel to Puerto Gaboto	7.000
Total length of line	1046.400

RAILWAY.	LENGTH IN KILOMETERS OF EACH SECTION.
San Cristóbal and Tucumán.	
From San Cristóbal to Suncho Corral. . . .	360.000
From the Ocampo Colony to Puerto Paraná . .	39.800
From Florencia Colony to Puerto Florencia . .	21.900
Central Entre-Riano.	
Main line from the Paraná cliff to Concepción del Uruguay and the National Mole . . .	289.500
Branch from Nogoyá to Port Victoria	51.500
" " Tala to Gualeguay.	110.300
" " Basabilbaso to Villaguay. . . .	61.900
" " id. to Gualeguaychú . .	99.700
Total length of line	612.900
North East Argentine.	
Line from Monte Caseros to Mercedes. . . .	140.500
" " Corrientes to Salados.	100.400
" " Caseros to Paso de los Libres . . .	100.000
Total length of line	340.900
East Argentine.	
From Concordia to Monte Caseros and Ceibo .	160.000
First Entre-Riano.	
From Gualeguay to Puerto Ruiz	9.600
Central Chubut.	
From Port Madryn to Frelew.	69.900

RAILWAYS WORKING,

CLASSIFIED ACCORDING TO GAUGE.

RAILWAY.	LENGTH IN KILOMETERS.
Broad gauge of 1 m. 676. (5'6").	
Western of Buenos Aires	564
Southern.	1.878
Buenos Aires and Ensenada	145
Central Argentine.	1.149
Western of Santa Fé	206
Buenos Aires and Rosario	1.457
Pacific.	691
Andine.	254
Great West Argentine	513
Villa María and Rufino	226
Villa Mercedes and Rioja	86
Great Southern of Santa Fé and Córdoba.	300
Bahía Blanca and Northwestern	205
	7.674
Gauge of 1 m. 435 (4'8" 1/2).	
Central Entre Riano.	612
North East Argentine	360
East Argentine	160
First Entre Riano	9
	1.141
Gauge of 1 m. (3'3").	
Transandine	173
Central Córdoba	210
Córdoba and Rosario.	278
Córdoba Central	285
Carried forward	1.546

RAILWAY.	LENGTH IN KILOMETERS.
Gauge of 1 m. (3.3") contd.	
Brought forward.	1.546
Córdoba and Northwestern	153
Dean Funes and Chilecito	298
Chumbicha and Catamarca	66
Central Northern.	398
North-West Argentine	152
Provincial of Santa Fé	1.046
San Cristóbal and Tucumán.	360
Ocampo Colony to Puerto Paraná.	39
Florencia Colony to Puerto Florencia. . . .	21
Central Chubut	70
	4.149
Gauge of 0 m. 60 (23 1/2").	
Córdoba and Malagueño.	26.200

RESUMEN.

1 m. 676 gauge	7.674
1 " 435 "	1.141
1 " — "	4.149
0 " 60 "	26.200
Total length of Railways working at 1st Jan. 1893.	12.990.200

RAILWAYS IN CONSTRUCTION.

SURVEYED, AND GRANTED.

The property of the Nation.

IN CONSTRUCTION.	KILOMETERS.
Dean Funes and Chilecito Railway.	
From Patquia to Chilecito	133.568
Central Northern Railway.	
From Salta to Carril.	35.000
	168.568
UNDER SURVEY.	
Central Northern Railway.	
Branch from Cerrillos to Rosario de Lerma . .	10.750
" " Carril to Guachipas.	50.250
	61.000

GUARANTEED RAILWAYS.

IN CONSTRUCTION.

Transandine Railway (Río Blanco to the frontier).	54.000
Northeast Argentine " (Mercedes to Saladas and Libres to Posadas)	470.900
San Juan to Chumbicha.	530.000
Central South American.	517.200
Bahía Blanca and Northwestern (Hucal to Villa Mercedes and Río Cuarto)	974.000
Villa Mercedes and Rioja (Toma to Rioja) . .	509.400
Goya to Lucero	89.700
Nanducito to Presidencia Roca.	516.700
9 de Julio to San Rafael	744.400
	4.397.300

GUARANTEED RAILWAYS.

GRANTED.	KILOMETERS.
Chilecito and Mejican Railway. Plans approved .	44.400
Chumbicha, Tinogasta & Andalgalá Rly "	364.000
San Juan & Salta Railway. Plans partly approved.	950.000
Austral Chaco " , " "	633.900
Intereoceanic " , " "	1.250.000
Rufino and Bahía Blanca Railway. . . .	560.000
San Pedro and Rosario de la Frontera " . . .	1.160.000
Villa María and Reconquista Railway	573.000
Santa Rosa and Oran	220.000
Mendoza and San Rafael.	224.000
Villaguay, Mercedes, La Paz and Concordia . .	522.000
Tinogasta and Chile Railway	220.000
Jujuy and Bolivia "	300.000
Paraná and Monte Caseros "	312.000
	7.333.300

UNGUARANTEED RAILWAYS.

IN CONSTRUCTION.

Central Argentine Railway.	
(From Capilla del Señor to Pergamino) . . .	158
Buenos Aires and Rosario Railway.	
(From San Fernando Canal to Las Conchas) . .	3
	161

GRANTED.	KILOMETERS.
Railway (narrow guage) from Buenos Aires to Rosario . . . . . surveys approved .	303.900
" from Pilar to Campana "	37.400
" " Luján to Melincué "	239.000
" " Rosario to Pergamino "	105.900
" " Villa Const. to Acevedo "	53.600
" " Carlota to Río Cuarto "	106.500
" " Buenos Aires to Bahía Blanca (Southern Railway)	560.000
Southern Railway (San Vicente to Tapalqué) .	205.000
National Transport Co. (Victoria to San Justo) .	39.000
Villa María and Cármen de Patagones. . . .	965.000
Rosario, Lincoln. Pigué and General Acha . .	727.000
Buenos Aires and Córdoba Rly	662.000
" " " Villa Jardín "	7.000
" " " Trenquelauquen.	480.000
Zárate and Boca del Riachuelo.	90.000
Godoy and San Nicolás.	28.000
	4.609.300

The construction of the Transandine and Northeast Argentine Railways and of the branch from the San Fernando Canal to Las Conchas is being actively carried on. The works on the Villa Mercedes and Rioja line are almost stopped, and on the others are entirely suspended.

GENERAL RESUMEN.

	KILOMETERS.
Railways open to public service	12.990.200
" , construction of which is being actively carried on	527.900
" , construction of which partly stopped .	500.400
" , " of which is completely stopped	3.698.568
" surveyed	4.088.600
" under survey	61.000
" to be surveyed	7.793.700
	29.660.368

CAPITAL

REPRESENTED BY THE RAILWAYS OF THE ARGENTINE REPUBLIC IN THE YEAR 1892.

	DOLLARS [1]
Andine	4.123.608
East Argentine	5.051.573
Buenos Aires and Rosario	41.185.753
Buenos Aires and Pacífico	16.251.818
Bahía Blanca and North Western	4.269.587
Buenos Aires and Ensenada	10.097.243
Central Argentine	49.172.613
Central Córdoba	4.824.932
Central Córdoba (Central Northern section)	20.262.446
Central Entre-Ríos	13.293.613
Central Northern	13.623.964
Central Chubut	964.878
Chumbicha to Catamarca	2.219.220
Dean Funes to Chilecito	11.804.490
Great West Argentine	18.819.760
Great Southern of Santa Fé and Córdoba	4.363.434
North West Argentine (Tucumán to La Madrid)	5.106.720
North West Argentine (Villa Mercedes to Rioja)	1.874.377
North East Argentine	30.150.521
Western of Santa Fé	3.859.513
Western of Buenos Aires	30.322.423
First Entre-Ríos	148.435
Provincial of Santa Fé	17.751.157
Southern	70.397.529
San Cristóbal to Tucumán	7.439.666
Transandine	4.981.661
Villa María and Rufino	5.524.199
	397.684.593

(1) One hundred dollars (U. S. A.) are equal to one hundred and three dollars sixty four cents. Argentine gold.

RAILWAYS GUARANTEED BY THE NATION.

(YEAR 1892.)

RAILWAYS.	LENGTH IN KILOMETERS.	PER CENT PER KILOMETER.	CAPITAL IN DOLLARS.	INTEREST GUARANTEED.	AMOUNT OF GUARANTEE IN DOLLARS.
East Argentine. . . .	160.000	29.834	4.773.440	7 %	334.141
Buenos Aires and Pacific .	691.300	19.429	13.425.459	7 %	939.780
Great west Argentine. .	513.500	19.426	9.975.251	7 %	698.267
North west Argentine. .	152.200	21.700	3.302.740	5 %	165.137
Villa María and Rufino .	226.840	17.377	3.941.799	6 %	236.508
San Cristobal to Tucumán.	360.000	17.850	6.426.000	5 %	321.300
North East Argentine. .	340.900	29.429	10.032.346	6 %	601.941
Transandine	124.000	30.673	3.803.452	7 %	266.241
Bahia Blanca and North west ern	242.200	19.297	4.673.733	5 %	233.687
Central Córdoba (Northern Section)	885.000	22 896	29 263.411	5 %	1.015.170
	3.695.940		80 617 611		4.806.105

RAILWAYS BELONGING TO THE NATION.

YEAR 1892.

RAILWAYS.	KILOMETERS	CAPITAL IN DOLLARS.
Andine	254.000	4.123.608
Central Northern	397.800	13.623.964
Chumbicha to Catamarca .	66.000	2.219.220
Deam Funes to Chilecito. . .	289.500	11.804.190
First Entre Ríos	9.680	148.735
	1.017.000	31.919.719

The 397.684.593 dollars which represent the total of the Argentine Railways are distributed as follws:

Railways belonging to the Nation .	Dollars	31.919.719
Do. do. guaranteed by the Nation .	"	80.559.519
Do. do. belonging to provinces . .	"	18.233.597
Do. do. of private property . . .	"	266.971.758
Total.	Dollars	397.684.593

The gross receipts of all the Railways to 1.st January 1892 amounted to 55.417.557 dollars, as follows:

National Railways	Dollars	972.175
Provincial do.	"	2.964.075
Railways guarenteed by the Nation.	"	8.430.243
Private Railways	"	43.051.062
Total.	Dollars	55.417.557

The working expenses of all the lines to the same date amounted to 37.852.768 dollars; as follows.

National Railways.	1.475.974
Provincial do.	2.563.940
Railways guaranteed by the Nation . . .	8.658.477
Private Railways.	25.154.377
	37.852.768

The profits and losses in the year 1891 amounted to 19.028.853 dollars, distributed as follows:

	PROFITS IN DOLLARS.	LOSSES IN DOLLARS.
National Railways.	503.779	—
Provincial do.	400.135	—
Guaranteed do.	—	228.234
Private do.	17.896.685	—
	18.800.619	228.234

According to the Office of Accountancy and Control of the General Direction of Railways, the Guaranteed Companies, in the year 1891, owed the Government for guarantees considered to be unduly paid the sum of 4.087.389 dollars, distributed among the Companies as follows:

Buenos Aires and Pacific	$	1.584.672
Central Córdoba (Central Northern Section)	"	1.095.503
Great West Argentine	"	1.318.137
Transandine	"	15.220
North East Argentine	"	34.098
San Cristóbal to Tucumán.	"	2.081
North West Argentine.	"	2.813
Villa María and Rufino	"	10.789
Bahía Blanca and North Western . . .	"	24.076
	$	4.087.389

COMPARATIVE STATEMENT OF THE

IN THE YEARS 1888,

RAILWAYS.	STOCK AT 31st DECEMBER 1888.			STOCK AT 31st DECEMBER 1889.		
	ENGINES.	CARRIAGES.	WAGONS.	ENGINES.	CARRIAGES.	WAGONS.
Andine	13	16	121	13	16	121
East Argentine	10	22	188	10	24	217
Buenos Aires and Rosario	57	60	2434	81	83	3177
Buenos Aires and Ensenada	18	41	600	22	44	724
Buenos Aires and Pacific	25	43	499	41	43	989
Bahía Blanca North Western	—	—	—	—	—	—
Central Entre-Rios	9	20	182	9	20	196
Central Córdoba	—	—	—	10	20	181
Central Córd. (Cent. N. Section) / Central Northern	79	90	1210	94	122	1454
Central Argentine	65	38	1511	84	58	2038
Chumbicha to Catamarca	—	—	—	3	7	79
Chubut Central	—	—	—	3	6	59
Dean Funes to Chilecito	—	—	—	—	—	—
Argentine Great Western	48	37	315	58	40	654
Great South. of S'ta Fé & Córd.	—	—	—	—	-	—
Argentine North Western (Tucumán to La Madrid)	7	12	206	11	12	206
Do. do. V. Mercedes to La Rioja	—	-	—	-	—	—
Buenos Aires Northern	15	45	279	23	61	370
Argentine North Eastern	—	—	—	—	—	—
Buenos Aires Western	94	94	2788	124	206	3758
Santa Fé Western	12	19	186	12	21	225
1st Entre-Rios	2	2	17	3	2	17
Santa Fé Provincial	29	68	486	36	75	533
Great Southern	97	184	3426	114	255	4498
San Cristobal and Tucumán	—	—	—	—	—	—
Transandine	—	—	—	—	—	—
Villa María and Rufino	—	—	—	—	—	—
Totals	580	491	14448	751	1115	19496

ROLLING STOCK OF THE RAILWAYS

1889, 1890 AND 1891.

STOCK AT 31st. DECEMBER 1890			STOCK AT 31st. DECEMBER 1891.			INCREASE DURING 1891.			TOTAL INCREASE FROM 1st. JANUARY 1888 TO 31st. DECEMBER 1891.		
ENGINES.	CARRIAGES.	WAGONS.	ENGINES.	CARRIAGES.	WAGONS.	ENGINES.	CARRIAGES.	WAGONS.	ENGINES.	CARRIAGES.	WAGONS.
16	16	158	16	16	158	—	—	—	3	—	37
10	24	287	14	27	285	4	3	—	4	5	97
97	116	4104	106	142	4536	9	26	432	49	82	2102
24	52	921	26	58	1031	2	6	110	8	17	431
41	53	1145	41	55	1151	—	2	6	16	12	652
—	—	—	15	8	252	15	8	252	15	8	252
19	26	272	19	26	272	—	—	—	10	6	90
10	21	914	10	20	1016	—	—	102	10	20	1016
74	99	1313	89	92	1313	15	—	—	30	22	466
20	45	363	38	55	567	18	10	204	18	35	204
107	138	2430	139	163	3532	32	25	1102	59	80	1742
4	7	79	5	8	77	1	1	—	5	8	77
3	6	59	4	6	59	1	—	—	4	6	59
—	—	—	3	15	413	3	20	413	3	15	413
58	49	715	58	49	728	—		13	10	12	413
21	6	347	21	8	586	—	2	239	21	8	586
13	12	206	13	12	371	—	—	165	6	—	165
2	6	54	4	6	54	2	—	—	4	6	54
—	—	—	—	—	—	—	—	—	—	—	—
3	4	50	10	16	176	7	12	126	10	16	176
148	296	3688	148	160	3688	—	—	—	54	66	900
15	21	272	15	22	271	—	1	—	3	3	85
3	2	17	3	3	17	—	—	—	1	1	—
43	80	683	53	107	924	10	27	241	24	39	438
149	282	5856	183	234	6967	34	—	1111	86	50	3541
—	—	—	12	27	421	12	27	421	12	27	421
—	—	—	3	7	128	3	7	128	3	7	128
—	—	—	9	12	189	9	12	189	9	12	189
880	1271	23923	1057	1354	29182	177	189	5254	477	563	14734

LIST OF ROLLING STOCK OF THE ARGENTINE RAIL

RAILWAYS.	KILOMETERS.				ENGINES.			
	1888	*1889*	*1890*	*1891*	*1888*	*1889*	*1890*	*1891*
Andine	254	254	254	254	0,051	0,051	0,053	0,053
East Argentine	160	160	160	160	0,062	0,062	0,062	0,087
Buenos Aires and Rosario	549 500	554	1459	1459	0,104	0,148	0,067	0,073
Buenos Aires and Ensenada	106 684	106 684	111 442	145 600	0,168	0 248	0,215	0,178
Buenos Aires and Pacific	685	685	685	685	0.036	0,060	0,060	0,060
Bahia Blanca and North Western	—	—	—	205 500	—	—	—	0,073
Central Entre Rios	280	287	287	612 900	0,032	0,032	0,066	
Central Córdoba (Cent. Nort. Sect.)			884	884			0,083	0,100
Central Northern			226	398 200			0,088	0,085
Central Argentine			927 900	1144			0,116	0,121
Chumbicha and Catamarca	—	—	66	66	—	—	0,091	0,075
Ceotral Chubut	—	—	70	70	—	—	0,043	0,047
Dean Funes to Chilecito	—	—		289 600	—	—		0,056
Great West Argentine	513	513	513	513	0,093	0.113	0,113	0,113
Great Southern of S. Fé and Córd.	—	—	300	300	—	—	0,040	0,070
North West Arg. (Tuc. to La Madrid)	52	150	168	168	0,134	0,071	0,073	0,073
North West Arg. (V. Merc. to Rioja)	—	—	86 300	86 300	—	—	0,023	0,046
North East Argentine	—	—	240 900	240 900	—	—	0,013	0,051
Western of Buenos Aires	—	—	1022 115	541	—	—	0,145	0,272
Western Santa-Fé	211	211	211	211	0,057	0,057	0,071	0,071
First Entre-Rios	10	10	10	10	0,200	0,200	0,300	0,300
Provincial of Santa Fé	586	686	815	1109	0,049	0,032	0,052	0,047
Southern	1351 820	1351 820	1351 820	1593	0,071	0,085	0,110	0,122
San Cristobal to Tucumán	—	—	—	171 500	—	—	—	0,070
Trasandine	—	—	—	92 020	—	—	—	0,003
Villa Maria and Rufino	—	—	—	220	—	—	—	0,045
Central Córdoba	—	—	210	210	—	—	0,048	0,048

WAYS DURING THE YEARS 1888, 1889, 1890 AND 1891.

CARRIAGES.				SLEEPING-COACHES.				BRAKE VANS.				WAGONS.			
1888	*1889*	*1890*	*1891*	*1888*	*1889*	*1890*	*1891*	*1888*	*1889*	*1890*	*1891*	*1888*	*1889*	*1890*	*1891*
0.051	0.051	0.055	0.055	0.011	0.011	0.007	0.007	0.031	0.031	0.035	0.035	0.445	0.445	0.586	0.586
0.137	0.150	0.100	0.168	—	—	—	—	0.031	0.031	0.031	0.031	1.141	1.325	1.762	1.759
0.091	0.121	0.061	0.096	0.018	0.029	0.018	0.018	0.054	0.088	0.034	0.084	1.474	3.347	2.779	3.625
0.384	0.415	0.467	0.400	—	—	—	—	0.075	0.227	0.242	0.213	5.519	8.604	7.990	6.900
0.061	0.061	0.061	0.086	0.004	0.004	0.013	0.013	0.029	0.029	0.057	0.055	0.750	1.419	1.615	1.624
—	—	—	0.039	—	—	—	—	—	—	—	0.029	—	—	—	1.260
0.071	0.700	0.090	—	—	—	—	—	0.021	0.028	0.031	—	0.628	0.065	0.916	—
		0.094	0.104			0.013	0.015	—	—	0 010	0.010			1.387	1.340
		0.142	0.138			0.013	0 013			0.044	0.068			1.210	1.359
		0.133	0.142	—	—	0.016	0.019	—	—	0.091	0.036	—	—	2.528	3.000
—	—	0.106	0.121	—	—	—	—	—	—	0.045	0.045	—	—	1.151	1.151
—	—	0.086	0.086	—	—	—	—	—	—	0.029	0.029	—	—	0.809	0.814
—	—	—	0.069	—	—	—	—	—	—	—	0.031	—	—	—	1.743
0.070	0.070	0.086	0.086	0.002	0.010	0.010	0.010	0.033	0.084	0.068	0.068	0.583	1.191	1.325	1.350
—	—	0.020	0 026	—	—	—	—	—	—	0.033	0.020	—	—	0.123	1.933
0.231	0.089	0.675	0.675	—	—	—	—	0.115	0.040	0.656	0.656	3.846	1.334	1.101	1 101
—	—	0.069	0.069	—	—	—	—	—	—	0.030	0.035	—	—	0.500	0.593
—	—	0.018	0.066	—	—	—	—	—	—	0.039	0.046	—	—	0.200	0.687
—	—	0.179	0 281			0.010	0.013			0.069	0.189			3.182	6.590
0.090	0.100	0.100	0.099	—	—	—	—	0.038	0.038	0.042	0.042	0.843	0.843	1.246	1.241
0.203	0.200	0.200	0.200	—	—	—	—	0.100	0.100	0.800	0.800	1.600	1.600	0.900	0 900
0.116	0.107	0.098	0.096	—	—	—	—	0.038	0.036	0.028	0.028	0.793	0.724	0.810	0.806
0.106	0.146	0.145	0.109	0.029	0.043	0.042	0.046	0.074	0.082	0.096	0 112	2.164	3.240	4.236	4.323
—	—	—	0.157	—	—	—	—	—	—	—	0.122	—	—	—	2.339
—	—	—	0.007	—	—	—	—	—	—	—	0.006				1.217
—	—	—	0.054	—	—	—	—	—	—	—	0.045	—	—	—	0.813
—	—	0.100	0.093	—	—	—	—	—	—	0.038	0.039	—	—	1.314	1.800

The Brazilian Republic.

CHAPTER III.

THE RAILWAYS OF BRAZIL.

With all the nations of South America the problem of easy and economical means of communication, as the one most affecting the general progress, is the one to which all the countries have given their preferential attention.

Brazil has not been backward in promoting and fostering successfully the construction of its railways because by them she has been enabled to populate her enormous and rich territory, to open up her various industries and commerce, to organize with regularity the functions of the public administration, and what is more, to solidify the political union between the different States, many of them at great distance from the Central Power.

In this respect Brazil cannot say with the Argentine, Urugnayan and Chilian Republics, that its principal railways already extend to the frontiers of neighbouring nations establishing with the iron bonds the rapid international intercourse of general life and commerce. Its enormous territories, as in the United States, have required the assistance of the Nation in bringing about the construction of the great lines — a project in which all the public men of whatever party are interested. The problem of the iron roads of Brasil is the question of the advancement of the country and as such has the support and co-operation of all good citizens.

The railways already made are divided into three groups that we may call: The Northern; The Central; and the Southern.—The first is laid in the States of Rio Grande del Norte; Parahiba; Pernambuco; Alagoas; Sergipe and Bahia. The second in the States of Minas Geraes, Rio Janeiro and San Paulo; and the third in the State of Rio Grande do Sul.

In each one of these nuclei of railway networks, the lines generally are of local importance and of one meter gauge, although, however, some by the conditions and direction are destined to serve the general public traffic, among which we might cite the line from Recife to San Francisco, in the future it would have when incorporated with the Inter-Oceanic line in the State of Pernambuco; the Central Brazilian Railway; the Santos and Jundiahy Railway; and the principal line of Mogyana in the extensions proposed connecting with the lines running through the States of Goyas and Matto Grosso as far as the Bolivian frontier.

Amongst the lines projected and known as of international character we should mention that of Santos, that from San Francisco to the Paraguayan frontier, and that from Recife to Valparaiso which ceases to be a line of mere Brazilian importance when considered as of South American international character.

Casting a retrospective glance to the first endeavours to establish a railway in Brazil we find the law of October 31st 1835 authorizing the Government to grant the first concession for a railway to run from the Capital to the Interior in the direction of the neighbouring States of Rio Janeiro, Minas Geraes, and San Paulo. This concession was granted to Mr. Thomas Cochrane on November 4 1839 and later on was cancelled.

Following the interesting review on the Brazilian railways by that distinguished engineer Fernandez Pinheiro in his work "Le Bresil" published in 1889 by Santa-Anna Nery, we see that up to the year 1852 the problem of railway construction was wrongly based and was only manifested by the slow progress made in the public opinion because not a single rail was laid. As in all parts in the early days of the campaign in favour of the new mode of travel, the only view considered was that of speculation, and as such was left entirely to the enterprise and risk of private people. No notice was taken of the enormous power that this reform of communication would one day represent, nor did they consider that this new means of transportation was the most sure method of advancing the country, and for these reasons should not have been treated on the grounds of a private speculation but rather as of a national character.

These vacillations in the opinions lasted for a long time and the Government and Parliament in turn, because they were treating of the unknown, also doubted of the success of the system; but as right and good sense gained ground, especially when supported by patriotism, this first indecision was speedily overcome; it was recognized that the first railways could not be obtained without the material assistance of the Nation, and that the simple leave to construct and work them was not sufficient except where the industry is powerful and the cultivation of the soil is very advanced, conditions that were not found in a new country like Brazil.

The necessity for a National guarantee was thereupon recognized and the project of the law thus based was presented to the Brazilian Parliament and voted by the Legislature in 1852.

The decree N°. 641 of June 26th 1852 that promulgated

this law marked the real point of departure of the iron network of Brasil. By that law the Government were authorized to concede certain favours, notably the guarantee of interest to the line that ran from the Capital of the Empire crossing the Province of Rio Janeiro to unfold itself in Minas Geraes and San Paulo.

At the same time the law of 1852 fixed the terms for the concession of similar favours to other railways in other parts of the Empire.

The great principle thus founded on a proper footing could do not otherwise than achieve success and the Ministry and Legislature of 1852 deserve the thanks of the Country.

The Company of the Recife and San Francisco Railways (decree Nº. 1299 of December 19th 1853); the Bahia-Alagorinhas Cº (decree of December 19th 1853); the Dom Pedro II Cº, now the Central Brazilian, (decree Nº. 1598 of May 9th 1855); and the Santos-Jundiahy Cº. (decree Nº. 1759 of Abril 26th 1856) were the first fruits of the law of 1852. Of these four great lines the first and fourth at present give notable results; the third is also fairly prosperous, and only the second has given a negative result.

Besides these four concessions,—a notable fact at that time—a small local railway, only 17 kilometers in length, enjoying no guarantee or subvention (concession of the province of Rio Janeiro dated April 27 in 1852) showed that if State help were necessary for large lines, for the small ones private influence and aid were sufficient, and that the latter are only possible there where a paying traffic is to be found from the beginning, in order not to absorb the State funds which are necessary for the larger Companies. To the above mentioned small railway,

then called the Mauá Railway and now the Prince of Pará Railway, is due the honor of having started the first railway train in South America.

To-day, forty-one years afterwards when there are in Brazil 11.043 kilometers of railway in working, 5.402 under construction, 5.175 surveyed, 4.414 being surveyed, and 13.826 kilometers yet to be surveyed, when the principal lines are being prolonged towards the interior of the country; when the number of Companies and State lines amount to 108; it is to-day when the seed, so judiciously sown before, is germinating with palpable fertility, tha Brazil will gratefully repeat the names of her first great railway pioneers: Dom Pedro II who, from the very first, never ceased to give his constant and decided assistance to the great cause: Irineo Evangelista de Sousa, Visconde de Mauá, the first to work a railway in Brazil; Luis Pedreira do Couto Ferráz, Visconde de Bom Retiro, who had the honor of drawing up regulations for this great and growing industry, imposing the necessary conditions of safety and care so that it should not degenerate into inconsistencies, nor fall into the dangers of inexperience; Cristiano Benedicto Ottoni, whose name will ever be engraved in the gigantic boring works of the Dom Pedro II line across the imposing mountain range: Mariano Procopio Ferreira Lage, to whom is due the merit of having overcome the bias and fears then existing as regards entrusting the construction of railways, which was then in the hands of foreigners, to native engineers, thus opening a wide field to the Brazilian engineers: Bento Sobragy, Olivera—Bulhões, Ferreira Penna, Pereira—Passos, men who, in the first days of the Brazilian railways, were able to show what might be expected from native science, and

who to-day form the old guard, worthy of respect and respected.

In view of the enormous size of Brazil and of its extensive coasts being provided with excellent ports, the first necessity was to open up to each district its most natural and shortest exit towards the sea, without considering that at some more or less distant date, these arteries might become united and form one single network; in this manner were established the three systems which we have indicated in order to meet the demands of the exporting and importing commerce of the interior of the country, affording an easy exit through its principal ports, which in the Northern district are, :—Pernambuco and Bahía; in the Center district: Victoria, Río de Janeiro and Santos; and in the Southern: the mouth of the River Grande del Sul, its only exit to the Atlantic Ocean, and which is very badly qualified to serve the commerce of that State, whose wants are chiefly supplied through the port of Montevideo and those of the River Uruguay (Salto and Concordia.)

The population of Brazil, already some 15.500,000 souls, its enormous products and commerce, show the necessity for rapid and cheap communication between its States, and the inter-union of these three independent systems of railways; and to gain this end, which will be of the greatest importance for Brazil, for many reasons, the Public Powers are allying themselves with private enterprise.

On the 1st. of January 1892 the total length of the lines in Brazil to which concessions have been granted was 39.984 kilometers—0.67 meters, distributed as follows:

Working . . .	10.280	kilom.	420 met:
In construction .	5.333	"	800 "
Surveyed . . .	7.768	"	943 "
Being surveyed .	4.414	"	277 "
To be surveyed. .	12.186	"	627 "
	39.984	kilom.	067 met:

These, as a rule, have a single track, and the greater part of them are of 1 meter gauge.

Except for one short line in the State of Pernambuco called the Recife—Olinada—Beberibe Railway and which is 1 m. 40 cm. between the rails, the broad gauge is 1 m. 60 cm. The first four concessions granted in accordance with the law of 1852 are the only lines existing in Brazil which are of this gauge, as, in later concessions, the 1 meter gauge was nearly always adopted. Even in the extensions of the first four lines referred to, the broad gauge was altered; so that, in the line from Recife to San Francisco, the first 125 kilometers, to Palmares are of 1 m. 60 cm. gauge, and from thence on towards San Francisco, the State has constructed 146 kilometers 420 meters of line of 1 meter guage;—of the line from Bahia to San Francisco only 123 kilometers, as far as Alagoinhas, are of 1 m. 60 cm. gauge, and from thence on in the direction of the River San Francisco, a length of 321 kilometers, 996 meters has been constructed, for the account of the State, of 1 meter gauge; the Central Brazilian line (formerly called the Pedro II) which runs towards San Francisco on the one hand and on the other along the Parahiba towards San Paulo has been constructed for 725 kilometers of 1 m. 60 cm. gauge, and from the stations Lafayette and Cachoeira towards the River San Francisco

and San Paulo respectively, of one meter gauge; lastly, the line from Santos to Jundiahy and its prolongation, built by the Paulista Company, together 381 kilometers in length, is of the broad gauge, whilst for their extensions towards the interior of the State of San Paulo, carried ont by different Companies, the narrower gauge has been accepted.

These lines of 1 met. 60 cm. gauge were on a very severe technical programme; in the first line, the minimum curve radius was 400 meters and the maximum gradient 12 met. 50 per 1000; in the second, the former was 300 meters and the latter 12.^{50} per 1000; in the third, the minimum radius was 181 meters and the maximum gradient 18 per 1000; and in the fourth line, the minimum radius, for a length of 8 kilometers, was 603 meters with gradients of 101 met 6 per 1000 (in these 8 kilometers traction is performed by a cable worked from fixed engines), and in the remainder of the line to Jundiahy and in the part built by the Paulista Company, the minimum radii adopted were 241 and 301 meters with maximum gradients of 25 and 20 per 1000.

In the early days of railways, Brazil, like other countries, paid its tribute to inexperience, by adopting a very severe technical programme for the development of its lines, which had to run between mountains and slopes.

A reaction speedily set in; and local communication and the prolongation of the first 1 met. 60 gauge lines, were effected, as a rule, on the one meter gauge, which easily allowed of grades of 30, 33 and 35 and, in special cases, of 83, 150, and 300 millimiters per meter (for railways on the rack system) with curves of from 80 to 60 and even of 40 meters radius.

Curves of such small radius have not, however, a very

prejudicial effect on the permanent way, nor on the safety of the traffic, thanks to the class of rolling stock used by all the Companies: American engines (which are less rigid than the European) of a reduced rigid base, of more than three driving axles when necessary, and with a bogie in front; and waggons and carriages mounted on bogies which allow of long bodies and greater commodity for passengers.

As we have already said, the greater part of the Brazilian Railways have been constructed on the narrow gauge, and the 10.280 kilometers open to public service up to the 1st of January 1892 are distributed as regards gauges, in the following manner:

Gauge of	0 m 66	139 km.	500 m.
"	0 m 76	377 "	000 "
"	0 m 95	53 "	000 "
"	1 m 00	7.937 "	634 "
"	1 m 10	407 "	289 "
"	1 m 40	12 "	000 "
"	1 m 60	1.353 "	997 "
Total		10.280 km.	420 m.

The question of the gradients naturally entails a less return from the engine, which is inevitable, either because, as often happens, it is impossible to work in any other way, or because the state of the Company's funds force it to sacrifice rapidity to economy, which, although an evil, at least allows the existence of a railway which, after all, will effect transport more cheaply and quickly than carts or mules.

The cost of the lines being worked at January 1st 1893, including preliminary expenses, expropriations, installations,

fixed and moveable stock, buildings, shops and tools may be estimated at 305.596, 190dollars distributed as follows:

2744 kms.	380 m.	property of the State	110.501.052	dollars
5649 "	239 "	" of Companies with State guarantee	160.961.566	"
1886 "	801 "	property of Comp'lies without State guarantee.	34.133.572	"
			395.596.190	dollars

This cost gives a mean price of 29.726 dollars per kilometer, the price varying from 95.364 á 9652 to dollars.

Taking all the lines together, the movement realized gives an average profit of 3.69 per cent on the capital employed on the lines handed over to public service, some of which have produced 3, 4, 5, 7, 10, and up to 14.9 per cent.

But let us consider only the average rate of profit viz 3.69 % returned by the railways whose receipts already cover their working expenses: "is it not true that, putting on one side the well being and industrial and agricultural development afforded to a country by railways, this is sufficiently stimulating, when we consider that in new profit countries railways must at first pass through very difficult times? "

The principles which should govern the construction of railways in Europe differ very greatly from those affecting the same question in the new countries of America.

In the first instance, the railway goes to meet an already assured traffic, and if good profits are not realized from the very beginning, the undertaking is a poor and even ruinous one.

In a young country with a great future before it, like Brazil, the railways marches like an explorer; like those bold explorers that civilized Europe sends across the African

deserts, it is the railway that opens up and makes valuable its countless riches; it is the railway that will stimulate agriculture to take advantage of the unequalled fertility of that greedy soil that extends through varied districts and bears most varied produce; it is the railway that affords to industry the means of propagation, dissemination and development. In this manner it creates its future traffic, but till then it has a difficult period to pass through, a period more or less long according to the district it has been chosen to serve, and the nature of the route adopted.

Some of the Brazilian lines have already passed through this period, a proof of which are the profits we have above quoted. These same railways, notwithstanding, at the commencement gave very scanty returns and it was from the guaranteed interest that the shareholders then derived the greater part of their dividends.

The proceeding, therefore, in advanced countries is very different to that governing the construction of railways in Brazil and the other States of this Continent.

In such circumstances, the average figure that we have above quoted, is nothing more than the speculative outcome of statistics. If we wish to study the financial side of the Brazilian railways and gain an idea of their past, present and future, it will be necessary, to avoid mistakes, to do so on an economist's basis. One will then have to make one's self thoroughly acquainted with the very special work of a railway in a young country, after which it will be necessary to take each railway separately, to study the district it traverses, the greater or less degree of foresight shown in the selection of the route and to see up to what point economy has governed the execution of the works; it will then be necessary to take into account the action of time, the development of the district traversed

and in what manner it has responded to the hopes based on it.

In this task we must lay aside the general importance of the lines in combination to give our attention to each line separately and distinctly. By so doing we shall find that there are some lines that have in a short time conquered the first difficulties and are now in a prosperous condition; others are in the way of doing so, and others are still passing through troubles and will continue to do so for a longer or shorter period. It will also be seen that Brazil in common with the other countries of the New World has done well by anticipating the future in the construction of its railways.

Principal Railways in a prosperous condition [1]: As we have now finished our general remarks on the Brazilian railways, it will probably be useful to call the reader's attention to the more important lines that are already in a prosperous condition.

The Central Brazilian Railway: is the most important line in the Republic not merely for its great traffic and large capital interests but for the important character of its works, the difficulties of the general construction and the property which it possesses. The project of this line dates from the year 1835, the first concession being granted in 1840; but from 1835 to 1852 nothing practical was done and the time was lost in attempts to float companies, granting and extending useless concessions, until the law of June 26th 1852 with a State guarantee of interest put a new face upon the question.

It was at the same time necessary to overcome no

(1) In the numeration we will adopt the same order as that of the distinguished Brazilian engineer Sr. Fernandez Pinheiro in the work which we have already mentioned Sta Anna Nery 1889.

small difficulties in dissipating the suspicious atmosphere with which the matter was surrounded through the failure of the earlier projects, and only on May 9ch 1855 was a company formed which commenced the surveys for the line and put in hand the construction of the works on the first two sections. The first length of 48 kilometers was opened to traffic on March 28th 1858 and in 1860 the whole of the first section was also completed, and without having any notable works it had had to cross in the latter part low-lying lands liable to floods.. The work on the second section was still continued in its crossing of the mountain range round the coast and in this were carried ont some most important works and constructions.

In 1865 the line was open for 133 kilometers, but owing to the exceptionally costly works in crossing the mountains the capital of the Company was exhausted.

On July 10th 1865 the Government by a mutual arrangement rescinded the concession in order that the State, by making it the first national line, could give to the railway the impulse that was required. On January 1st 1892 the 133 kilometers received from the old company had reached an extension of 1118 kil. 771 m. open to traffic as follows:

(1) Main Line from the Capital to Lafayette (guage 1.60 m.)			462K.290 m.
Branches: (a) from Gamboa to Cáes. . .			1 " 123 "
" (b) " Campinho.			1 " 524 "
" (c) " Santa Cruz			34 " 090 "
" (d) " Macacos			4 " 929 "
" (e) " San Paulo			157 " 198 "
" (f) " Port Niceres de Cunho .			63 " 764 "
			724K.918 m.

(2) Main line from Lafayette to Sabara (gauge 1 m.)	120K 402 "
Branches: (g) from San Paulo to Cachoeira.	231.000 "
" (h) " Ouro Preto	42.451 "
	1118 k. 771 m.

The prolongation of this line runs in the direction of the River San Francisco descending the valley of the river Velhas; at present the section as far as Santa Lucia should be completed, and the construction of the extension of 50 kilometers from there in the direction of Curvello, the plans for which were approved on May 6th 1892, should be already in hand.

The line commences in the Federal Capital, crosses a great part of the State of Rio Janeiro and then runs through the States of San Paulo and Minas Geraes.

On leaving the capital it ascends the imposing coast range of mountains that are penetrated by a succession of tunnels, high embankments, heavy cuttings, sustaining walls and at the summit by a long tunnel of 2.237 meters, bored at an altitude of 460 meters above sea level; from this it descends into the valley of the river Parahiba and splits into two great systems, one of which runs up this river and into the State of San Paulo, the other descends the river and runs through the territories of the States of Rio Janeiro and Minas Geraes.

From this second system a third strikes off at 200 kilometers distance and forms part of the main trunk line running principally across the State of Minas Geraes and running towards the navigable watercourse of the Upper San Francisco.

The general plan of the two first systems includes, besides earthworks of considerable importance, some notable bridges over the Parahiba which is crossed several times. On the central trunk line, after a very difficult section to the foot of the Mantiqueira mountain range, this has to be ascended to a height of 1117 meters above sea level, with no lesser difficulties than those of the second section of the coast range and further on the Taipas mountains.

In the whole of the distance heavy earthworks and really notable works of art are met with. It may be said that in the whole length of the Central Brazilian Railway there is not one single stretch of easy line; in the broad guage part (725 kilometers of 1 meter 60 track) it has been necessary to continually employ gradients of 18 millimeters per meter, and curves of 180 meters radius, and in its narrow guage (1 meter) prolongation gradients of 20 millimeters per meter and curves of 117 meters radius.

Up to the 1st of January 1892 the capital employed in the line opened to public service, was distributed as follows:

1 meter 60 gauges.

Central line	1st Section	$	4.393.962
	2nd "	"	7.651.927
	3rd "	"	2.632.833
	4th "	"	6.567.058
	5th " (to Lafayette)	"	10.454.704

Branches	Santa Cruz	"	666.196
	Macacos	"	41.052
	San Paulo	"	5.739.486
	Puerto Nuevo de Cunha	"	2.934.531
	Paty del Alferez	"	6.377

Stations	$	5·374.436
Offices and store in San Diego	"	656.330
Engineers office in Town.	"	1.083.730
Engine house in the Entre-Rios and S. Julian Bar	"	321.730
Rolling Stock	"	5.881.288
Furniture and tools	"	314.523
Sundries.	"	162.839
Pintsch gas lighting	"	74.403
	$	54.977.405

1 meter gauge.

Central line	5th	Section (Lafayette to Congonhas .	$	989.575
	6th	. . . . .	"	4.746.175
Branches		San Paulo to Cachoeira	"	5.461.223
		Ouro Preto . . .	"	2.317.163
Stations			"	228.419
Rolling Stock			"	150.581
Animals.			"	10.046
				13.903.182
Total				$ 68.880.587

The total cost of the of 724.9[18] kilometers of 1 met. 60 gange proves to be $ 54,977,405 equal to an average of $ 75.839 per kilometer; and for the 393 [853] kilometers of 1 meter gange, an average of $ 35.300 per kilometer.

Receipts and expenses.

The general receipts for 1891, compared with those of the preceding year show the enormous increase of $ 2.263.345,

due to the increase in all traffics, especially of passengers, parcels, coffee and merchandize.

The following figures give a comparison of the general receipts in the years fererred to.

SOURCE.	1891.	1890.	DIFFERENCE IN 1891.	
			Increase.	Decrease.
Receipts { from traffic .	$ 8.808 492	$ 6.518.502	$ 2.289.989	
" rents. .	20.846	18.727	2.118	
" sundries	6.431	50.581		$ 24.155
Fines for infraction of contract.	2.063	4 460		2.296
Fines from employés .		2.200		2.211
	$ 8.837.832	$ 6.574.470	$ 2.292.107	$ 28.792
Increase			$ 2.263.345	

The working expenses amounted to $ 6.681.147, as show in the following statement.

SOURCE.	1891.	1890.	INCREASE IN 1892.
Administration	$ 71.842	$ 64.275	$ 7.567
Shops	42.593	30.821	11.771
Traffic	2.289.339	1.505.584	793.755
Accountants'Dept	162.893	133.409	29 489
Locomotives	2.234.581	1.538.840	695.740
Permanent way and buildings	1.879 899	1.741.581	118.318
	$ 6.681.147	$ 5.014.510	$ 1.676.640

The increase in working expenses of $ 1.676.640 shown in 1891 over 1890 is due, in the first place to the incorporation by the Central Brazilian Railway with the branch from Cachoira to San Paulo, 231 kilometers long, to the great amount of cargo in the Central, Marittme and San Diego Stations, and to the extraordinary production of

coffee, the carriage of which was delayed for want of rolling stock.

The following statement shows the receipts, expenses, profits and the percentage of the cost of working as compared with the gross receipts, taken at intervals of five years since 1858, when the line was inaugurated:

YEARS.	Kilometers open.	RECEIPTS.	EXPENSES.	PROFITS.	% OF WORKING EXPENSES
1858	62	$ 165 044	$ 112.252	$ 52.792	68.01
1863	90	564.547	472.814	91.728	89 14
1868	203	1.399.627	685.508	854.118	44.98
1873	375	3.500.444	1.933.942	1.566.495	46.26
1878	622	5.472.301	3.035.874	2.436.426	42.87
1883	723	6.332.011	3.581.956	2.750.054	56.56
1888	786	6.865.201	3.756.922	3.108.279	54.72
1891	1119	8.837.834	6.681.156	2.156.678	75.59

The followiny statement will give the number of each class of train run in the various sections and branches during the year 1891.

TRAINS.	1st. Section.	2nd. Section.	3rd. Section.	4th. Section.	5th. Section.	6th. Section.	BRANCHES. San Paulo.	Puerto Nuero.	Santa Cruz.	Macacos.	Ouro Preto.
Suburban	26.152	—	—	—	—	—	—	—	—	—	—
Interior passenger	2.695	2.637	1.051	85	852	—	852	919	3.711	—	—
Mixed	5.168	3.650	1.460	2.190	852	1.460	2.190	1.460	3 306	1.460	1.460
Goods	2.241	1.617	791	952	1.024	27	582	—	990	—	81
Special passenger	264	228	95	75	16	12	240	—	16	—	38
" goods	693	703	164	107	86	185	680	20	388	—	100
N.º of trains in 1891	37.213	8.835	3.561	4.176	2.830	1.684	4.544	2.399	8.411	1.460	1.679
" " " " 1890	28.761	8.089	2.980	3.954	2.892	1.654	4.103	2.300	8.400	1.460	1.606
Difference	8.452	746	572	222	62	30	441	0.99	11	—	73
Daily average in 1891	101 9	24.2	9.7	11.4	7.7	4.6	12.7	6.5	24 6	4.0	4.6
" " " 1890	73.7	22 1	8.1	10.4	7.9	4.5	11.2	6·3	23.0	4.0	4.4
Difference	23.2	2.1	1.6	1.0	0.2	0.1	1 5	0.2	1.6	—	0.2

The number of kilometers run by the trains and the daily average in 1890 and 1891 are as follows:

TRAINS.	*1st. Section.* KILS.	*2nd. Section.* KILS.	*3rd. Section.* KILS.	*4th. Section.* KILS.	*5th. Section.* KILS.	*6th. Section.* KILS.	BRANCHES. *San Paulo.* KILS.	BRANCHES. *Puerto Nuevo.* KILS.	BRANCHES. *Santa Cruz.* KILS.	BRANCHES. *Macacos.* KILS.	BRANCHES. *Ouro Preto.* KILS.
Suburban	444,472	—	—	—	—	—	—	—	—	—	—
Interior passenger	165,674	123,939	91,950	68,160	157,620	—	133,761	59,712	53,235	—	—
Mixed	265,314	171,550	131,400	118,990	114,240	125,738	289,810	93,410	111,680	13,140	62,780
Goods	97,709	26,609	71,280	76,219	71,861	991	85,539	—	33,034	—	3,353
Special passenger	15,867	10,645	8,550	5,772	1,723	538	19,132	—	370	—	1,126
" goods	23,991	33,562	14,110	8,000	4,763	8,676	83,794	1,280	12,714	—	4,202
Kilometers in 1891	1,012,329	415,705	320,320	277,761	380,167	135,946	613,039	154,452	211,063	13,140	71,161
" " 1890	838,243	379,907	267,985	258,606	364,281	118,173	576,118	146,944	197,478	13,110	68,418
Difference	174,286	35,798	52,335	19,155	15,886	17,773	36,921	7,488	13,585	—	3,043
Daily average in 1891	2,774	1,138	877	760	1,041	372	1,679	423	578	36	195
" " " 1890	2,296	1,040	734	708	998	326	1,575	402	511	36	187
Difference	478	98	143	52	43	46	101	21	37	—	8

Lastly, the number of trains run and the distance they have covered, is as follows:

1.60 METERS GAUGE.

TRAINS.	NUMBERS.	KILOMETERS RUN.
Passenger	26.152	444.472
" interior	7.082	846.533
Mixed	15.118	1.334.662
Goods	5.393	519.335
Special passenger	354	55.250
" goods	2.452	196.607
Total	56.551	3.396.858
1 METER GAUGE.		
Special passenger	38	1.159
Mixed	3.546	255.740
Goods	80	4.250
Special goods	195	13.537
Total	3.859	274.686

ROLLING STOCK.

Engines.

The following is a detailed statement of the engines owned by the Central Brazilian Railway on January 15th. 1892,

ENGINES.	NUMBER.			TOTAL.
	1 m. 60 gauge	1 meter gauge	1m. gauge (northern)	
English, with 4 driving wheels	4	1	3	8
" " 6 " "	12	—	2	14
American " 4 " "	74	7	17	98
" " 6 " "	29	—	6	35
" " 8 " "	24	4	—	28
" " 10 " "	1	—	—	1
Belgian, with tender, 4 driving wheels	1	—	—	1
French, " " 6 " "	1	—	—	1
English, " " 6 " "	—	3	—	3
" " " 4 " "	3	—	—	3
	149	15	28	192

Their condition was as follows:

1m.60 gauge.	In good condition	32
" "	" fair "	38
" "	Undergoing general repairs. . . .	36
" "	" small.	38
" "	Rented.	5
		149
1 meter gauge.	In good condition	1
" "	" fair "	8
" "	Undergoing general repairs . . .	2
" "	" small	4
		16
1 meter guage (North),	in good condition. . . .	12
" " "	" , " fair " . . .	7
" " "	" , undergoing extensive repairs	7
" " "	" , " small do. . .	2
		28

CARRIAGES AND WAGONS.

The number of these is 2482, as follows:

VEHICLES.	1.69 gauge	1 meter gauge	NORTH.	TOTAL.
American, for passengers and post office	160	12	27	199
Various, for animals, and goods	354	41	294	689
On four wheels for passengers and post-office	84	6	---	90
On four wheels for animals and goods	1457	47	—	1504
	2055	106	321	2482

HAULAGE.

The distance run by the engines in the year 1891 was 5.449.360 kilometers, divided as follows:

			Kilometers	Kilometers
1.60 Gauge.		For traffic . . .	4.222.886	
"	"	" the line . . .	162.536	4.386.422
1.00	"	" traffic . . .	279.817	
"	"	" the line. . .	58.158	337.975
"	"	(North). From June to Dec'r 1891.		
"	"	For traffic . . .	717.841	
"	"	" the line. . .	7.112	724.953
				5.449.350

The Central Brazilian Railway is not only important of account of the great benefits it confers on the district in serves; it has also become the great artery for a great system of railway lines converging from right and lett towards its own, and which make it what the law of 1852 intended it to be, viz, the great factor in the development of the States of Rio de Janeiro, Minas Geraes, and San Paulo.

SANTOS JUNDIAHY RAILWAY.—This railway starts from the port of Santos in the State of San Pau'o al Sud and terminates in Jundiahy in the same State; it is 139 kilometers long and the concession for it was granted by decree dated April 26th 1856. Its gauge is 1 met. 60 and up to the year 1874 it received the guaranteed interest of 7 %, since when it has not availed itself of it, because its takings exceeded that limit: the half of any excess over 8 % has been repaid to the State.

Up to 1874 the State had paid in guarantees the sum of $ 2.512.614, and the part of the profits returned to it up to the end of 1887 was $ 2.731.119. This splendid result clearly shows the foresight with which the concession of April 26th 1856 was granted.

The Company organized under this concession was called the "San Paulo Railway Company Limited" and obtained legal residence in Brazil on June 1st 1860. On November 24th of the same year the works were commenced and on the 16th February 1867 the whole length of 139 kilometers was opened to public service. The following statement shows the financial working from the commencement:

YEARS.	LENGTH WORKED KILOMETERS.	RECIPTS. $	EXPENSES. $	PROFIT. $	PERSENTAGE OF EXPENSES ON PECEIPTS.
1869. . . .	139	671.024	165 470	505.554	24 3/4
1872. . . .	139	1.083.673	532.661	551.211	49
1877. . . .	139	1.797.662	551.981	1.245.681	30 3/4
1882. . . .	139	2.953.943	1.026.786	1.927.156	34 3/4
1887. . . .	139	3.459.167	1 596.682	1.863.485	46 1/8
1891 (9 months).	139	3.360.985	2.591.911	769.073	77 1/10

A mere glance at this statement will explain the financial position of this Railway, which would be even more prosperous were it not that in one part haulage is effected by means of cables and fixed engines. In this section, besides the high cost of the first installation, the working expenses are very considerable;— notwithstanding this, the returns are encouraging.

In the three first quarters of 1891, for which we have data, 570.794 passengers (including 88.056 immigrants who travelled free) and 343.627 tons of merchandise were carried. The profits from traffic were at the rate of 7.71 % on the capital invested in the line.

This return, on account of the extraordinary increase in production, might have been much greater were it not for the serious inconveniences attending loading and unloading in the port of Santos, which gave rise to a real crisis in transport which still exists, although it has been energetically combatted. It is therefore to be hoped that with the measures taken by the Finance Minister with respect to a night service in the intervals between the storms, the effects of this crisis may be overcome, until such time as a more radical means be found for completely doing away with the evil.

During the first three quarters of 1891, there were 40 engines working on the line, these ran a distance of 1.764.065 kilometers, consuming 15.677.234 kilogrammes of coal.

The railway, starting fron its maritime port, Santos, reaches the foot of the Cubatão mountain range without great difficulty and with easy curves. To mount the range, the Company preferred the solution of inclined planes with gradients of 3 to $3\frac{1}{2}$ per cent, which, at the time that the line was surveyed, still frightened the majority of the engineers. This idea, unfortunately, being approved, the Railway ascends the mountain by means of four cable sections 8 kilometers in leugth and with a difference in level of 778 meters between the beginning of the first plane and tne conclusion of the last.

The first plane has :

1824	meters	with gradient	of $10\frac{1}{4}$ %
81	"	"	" $0_{m.}076$
1905	meters		

In this longth there are 1275 meters of straight line and 630 meters of curved, with radii of 804 meters.

The second plane has:

1271	meters	with	gradient	of	10 $_{12}$ %
421	"	"	"	"	10.46 "
82	"	"	"	"	0$_{m.}$ 0.76
1774	meters				

In this there are 1095 meters of straight line, 456 meters in curves of 603 meters radius and 223 meters in curves of 1206 meters radius.

The third plane has

254	meters	with	gradient	of	11 %
1748	"	"	"	"	10.28 %
83	"	"	"	"	0$_{m.}$ 0.76
2085	meters				

In this length, three are 527 meters of straight line, 715 meters in curves of 1206 meters radius, 288 meters in curves if 804 meters radius, and 555 meters in curves of 603 meters radius.

The fourth plane has:

1010	meters	with	gradient	of	10.28 %
44	"	"	"	"	5.12 %
182	"	level			
2236	meters				

There there are 629 meters of straight line and 1600 meters of curved, with radii that vary between 1609 and 603 meters.

In the passage from one section to another and at the summit of the last, á fixed machine, of 150 nominal horse power, with cylinders of 660 milimeters diameter and

pistons of 1520 millimeters stroke, move the cables by which one train is raised and the other lowered.

As the line is of single track, the crossing of the two trains is effected on a piece of double track in the middle of the section.

The cables are of steel, of 42 wires, of 34 milimeters diameter, and work at a tenth part of their trial load.

The danger of this method of haulage has rendered the following precautionary measures necessary:

1. Any cables which, in a length of 915 milimeters, have three broken wires, are withdrawn from service, 2. Pincer bräkes which securely grip the rails in case of necesity; 3. Electric connection which always allows the guard to communicate with the driver of the fixed engine.

For important works of art, there are sustaining walls and a large viaduct in the inclined plane section, and a tunnel, 591 meters long, in the section where ordinary traction is used. The viaduct, the most important work on the whole line, is 215 meters 25 milimeters long and 49 meters high; there are ten bridges of 20 meter spans, and one of $137^{25\,603}$ meters, and are placed on a curve of 603 meters radius with a gradient of 10.28 %. They are built of iron, except for the abutments and pillar bases which are of mosonry.

Paulista Railway. This is a prolongation of the foregoing and belongs to another Company, the primitive Company which obtained the concession, having renounced the right to make the extension. Its gauge is also 1 meter 60.

La Company formed for the construction and working of this prolongation, under the name of the "Companhia Paulista da Estrada de ferro de Jundiahy a' Campinas" was legally recognized by a decree dated March 28th 1888

From the old province of San Paulo it obtained a guarantee of 7 % for a term of 30 years; but shortly afterwards renounced it and repaid to the Treasury of that State the sums it had received.

The Company has extended its line to Rio Claro and has become owner of the Mogy-Guassu and Descalvados branches; in 1888 its capital amounted to $ 10.845.516.

The length of the Company's lines is 242 kilometers, all open to traffic.

The line possesses no notable works of art, and its technical features are shown in the general statement which will be given at the end of this sketch. As regards direction, and district traversed, the line is well situated, as the following statement of working results will show.

YEARD.	LENGTH OF LINE WORKED.	RECEIPTS.	EXPENSES.	PROFITS.	% OF EXPENSES ON RECEIPTS.
1872 . . .	klms. 44	$ 168.728	$ 101.005	$ 67.723	60 %
1877 . . .	135	832.057	301.992	530.065	36 1/3 "
1882 . . .	225	1 561.976	498.022	1.063.954	32
1887 . . .	242	1.534.632	681.521	853.108	43

In 1887 this line carried 248.081 passengers and 143.781 tons of goods. Its profits have exceeded 8 % on the Company's capital.

Mogyana Railway. The concession for one part of the lines belonging to the "Companhia da Estrada da Ferro Mogyana", whose legal existence was recognized by decree dated November 13th 1872, was granted by the Province of San Paulo and for the other part by the National Government. The first part from Campinas, (where it joins with the Paulista Railway) to Casa Branca, 173 kilometers long, with a branch from Jaguary to Amparo, 31 kilometers

long, were granted by the San Paulo Government with a guarantee of 7 % on a capital of $ 2.784.600. The section from Casa Branca to Ribeirão Preto, 143 kilometers in length, and the branch from Mogy-Mirim to Penha, 21 kilometers in length, were built without any guarantee or subvention on the part of the public powers. The whole system is of one meter gauge, and the results obtained from Campinas to Ribeirão Preto and from the Amparo and Penha branches have been excellent.

This line is divided into two parts which are distinct from each other, both on account of the difference in the dates of construction, and in the progress made in the districts traversed. The first and older part (from Campinas to Ribeirão Preto is already in a state of prosperity and in 1887 the profit from the traffic was almost 15 % of the cost per kilometer. The second part, the extension from Ribeirão Preto to Jaguára, with a guarantee by the National Government of 6 % on a capital of $ 3.360.007, is only of very recent construction, but is situated in a district in which, although very fertile, everything has yet to be done, and will therefore require some years before it can find itself in a prosperous condition. Having only just commenced working, this second part only returned 1 % profit in 1889, but it has a sure future as the whole district is prodigiously fertile, and agriculture is developing very remarkably. It should be added that this railway has been very economically constructed and is judiciously worked, a creditable fact to its administration and staff, who are all natives of the country.

This second part of the line, from Ribeirão Preto to Jaguára, is 193 kilometers long, and, as said before, receives a guarantee of 6 % from the National Government, as does also the branch from Cascavel to Pasos de Caldas

which is 77 kilometers long. On account of the large amount of earth to be moved and the works of art necessary, the cost of this branch amounted to $ 17.745 per kilometer; the line from Casa Branca to Ribeirão Preto cost $ 13.377 per kilometer and from thence to Rio Grande or Jaguára $ 17.128 per kilometer.

The Mogyana Company obtained from the Provincial Government of Minas Geraes the concession to extend its rails from the Rio Grande to the Paranahyba with a guarantee on the capital employed, to a maximum of $ 16.380 per kilometer. The line, penetrating into the State of Goyaz, will go as far as Catalan.

The capital required for the construction of the first section to the city of Uberaba was subscribed among the shareholders of the Company, and the demand for shares was such that they were distributed pro rata. This section is 102 kilometers long.

The total length of line open to traffic is 740 kilometers, distributed as follows:

Campinas to Casa Branca . . .	173 kil^{s}.	Constructed with a guarantee of 7 % from the Province of San Paulo.
Casa Branca to Ribeirão Preto. .	143 "	Unguaranteed.
Ribeirão Preto to Rio Grande (Yaguára)	193 "	With a guarantee of 6 % from the National Government.
Rio Grande to Uberaba	102 "	With a guarantee of 6 % from the Province of Minas Geraes.
Branch from Jaguary to Amparo.	31 "	With a guarantee of 7 % from the Province of San Paulo.
" " Mogy-Mirim to Penha	21 "	Unguaranteed.
" " Cascabel to Pasos dos Caldos	77 "	With a guarantee of 6 % from the National Government.
Total.	740 kil^{s}.	

During the years 1872 to 1878 the Province of San Paulo paid the Mogyana Company as guarantees the sum of $ 234.835, but the Company has already returned to the Treasury of the Province the whole of the amount so paid: the last payment was made on May 3rd 1886 since when the Campinas to Casa Branca line and Jaguary to Amparo branch have ceased to figure among the guaranteed lines.

In the Ribeirão to Jaguára section and Caldas branch of the Mogyana Company's lines, the profits are still small, and the following comparative statement will show the results of working from 1887 up to and including the first three quarters of 1891.

YEAR.	RECEIPTS.	EXPENSES.	PROFITS.
1887.	$ 191 596	$ 180.039	11.557
1888.	296.876	257.575	39.301
1889.	332.213	292.159	40.054
1890.	320.693	316.909	3.784
1891 (9 months) .	297.980	266.726	31.254

The traffic returns of the line from Jaguára to Catalan, since its opening to Uberaba, which took place on the 25th April 1889, were as follows:

In 1889 there was a profit of $ 24.641, in 1890 of $ 19.935, but in the first six months of 1891 there was a deficit of $ 21.687, but it is presumed that after the accounts for the second half of the year are made up, the deficit will be greatly reduced.

By a decree dated 23rd February 1891 the surveys of the extension of 137 kilometers onwards from Uberaba were approved with some modifications, the estimated cost being $ 1.822.488, or $ 13.303 per kilometer.

The technical features of this section are as follows:

Minimum radius.		100.10 met.
Maximum gradient		0.033 "
Length in tangents.	191 kil:	548 "
" " curves	35 "	452 "
" " " of minimum radius.	13 "	966 "
" on the level.		27.00 %
" " slopes		35.50 "
" " counter-slopes		37.50 "
Movement of earth	146.000 cubic meters.	

This section contains the following works of art: two twenty-meter bridges; 111 culverts, 6 stations and 6 water deposits, and the works were inaugurated on June 17th 1891.

By a decree dated 17th October 1891 the plans of a further 63 kilometers were approved, the estimated average cost per kilometer being $ 14152. The technical features of this section are as follows:

Minimum radius.		100.10 met.
Maximum gradient.		0.030 "
Length in tangents	42 kms.	339 "
" " curves	20 "	661 "
" " " of minimum radius.	6 "	278 "
" on the level		19 %
" " slopes		39 %
" " counter slopes		42 %
Amount of earth moved.	283.000 cubic metres.	

Buildings and works of art: one bridge of 40 meters; 4 retaining walls; 116 culverts; 3 stations, 3 water-tanks and 11 gang houses.

From the preliminary and final surveys the length of

the extension from Uberaba to Calan may be estimated as 390 kilometers; so that the direct line from Campinas in the State of San Paulo to Catalan in that of Goyaz, will be 1001 kilometers long.

Of all the Brazilian Railways, this important line has best served the interests of the country.

Rio Claro San Paulo Railway. This is a prolongation of the Paulista line of which we have already spoken. It commences at Rio Claro and 57 kilometers from there splits into two branches; one of 70 kilometers 225 meters which terminates in Araraguara, and the other of 137 kilometers 392 meters, which runs to Jahú, both in the Province of San Paulo: this gives a total length of 264 kilometers, all of one meter gauge. The State granted the concession by decree dated 4th October 1880. without any guarantee or subvention. The Company is called "Rio Claro".

The construction works were commenced on the 15th October 1881 and on the 2nd of May 1883 the first section of 77 kilometers was handed over to traffic. In 1887 the whole line was opened.

The capital of the Company is about $ 2 800.000, but the line and its equipment only cost $ 2.606.000 more or less.

By means of authority conferred by a decree dated 31st September 1889, the line was transferred to a new Company called the Rio Claro San Paulo Railway Company Limited, which at once took over the direction of the line.

The length of line open to traffic on January 1st 1890 was as follows:

Main line	127 klm.	225 m.
Branch to Jahú . .	137 "	392 "
Total. . .	264 klm.	617 m.

The financial results of this line in 1889 were: general receipts $ 621.954; expenses of administration, traffic, accountantcy, traction and permanent way $ 228.670; the profits were $ 393 284 or 14 % on the capital invested in the line.

Railways of the Leopoldina Company. "The system of railways belonging to this Company is the most extensive of any in Brazil, and comprises both lines conceded direct to the Company and others bought from other Companies, as also the Cantagallo line purchased from the Provincial Government of de Rio Janeiro. The primitive concession of the Company was granted on the 27th March 1872, and the concession for the Cantagallo line bears date August 23rd 1856: this later in the most interesting portion on account of its technical features: it gauge is 1.10 meters, the other lines of the Company being of 1 meter gauge."

"The Cantagallo line is noticeable as being composed of very pronounced gradients and sharp curves: it was equipped and worked for a long time with Fell engines, but ordinary system of traction is now used, powerful engines, constructed in the shops of the Baldwin Locomotive Works, Piladelphia U. S. A. being employed."

"In the general statement, to be given at the end of this sketch, the technical features of this special section will be shown, and we will only give here a few figures respecting the simple adhesion engines now used and which are cheaper and give a better return than the Fell engines formerly employed."

The most modern of these simple adhesion engines for the section of stiff gradients and curves of small radius (8.3 per 100 the former and 40 meters the latter) is an engine with tender, with three coupled axles, cylinders of

18" diameter and 20" stroke (0.457 × 0.508); the wheel base is 8'3" (2 514) and their diameter 39" (0.991); the outer pairs of wheels have a flanged tyre, and the inner pair a tyre of 5 1/2" (0.140) without tyre. The total weight of the engines when ready for the road is 88.000 lbs. (39.865 kilogrammes, and they are capable of hauling a train of 40 tons at a speed of 14 kilometers per hour".

"The Leopoldina Company's system works very important districts in the States of Rio Janeiro, Minas Geraes, and Espiritu Santo.—On the 1st of January 1890 it had 1180 kilometers 855 meters open to traffic; of these 417 kil: 0.39 met. are in the State of Rio de Janeiro and 763 kil: 816 met: are in that of Minas Geraes.

River system.— 1.10 met. gauge.	Kil. mts.
Central line. Nictheroy to Macaco	178.426
Macahé branch. Porto das Caixas to Macahé.	146.513
	324.939
1 met. gauge.	
Sumidouro branch	92.100
Total.	417.039

Minas Geraes system.--1 met. gauge.	Kil. mts.
Central line. Puerto Nuevo do Cunha to Saude.	368.927
Pirapetinga branch. Volta Grande to Pirapetinga.	31.032
Alto Muriahé do. Recrea to Santa Lucia de Carangola.	149.347
Leopoldina do. Vista Alegre to Leopoldina. .	12.284
Serraria do. Serraria to Sigacão	150.416
San Paulo sub-do. Patrocinio to San Paulo do Muriahé	17.733
Pomba do. Guarany to Pomba	27.196

Rio Novo do. Furtado de Campos to the Rio Novo	6.881
Total.	763.816
General total	1180.855

Up to the 1st January 1890 the capital employed was $ 32.628.927, the average cost per kilometer being $ 27.631.

The Company's capital at the same date was $ 27:300.000 divided into 25.000 shares of £ 20 each, 68.000 being preference and 182.000 ordinary.

Of this capital, $ 8.294.073 enjoy a guarantee of 7 % per annum, granted by the State of Minas Geraes for the following sections:

San Gerardo to Saude.

Sigacâo to Serraria.

Guarauhy to Pamba.

Tombos to Santa Lucia do Carangola.

The said State subventioned also, at the rate of $ 4914 per kilometer, the construction of the following sections:

Puerto Nuevo to Cataguazes.

Vuelta Grande to Pirapetinga.

Recreo to Tombos.

Vista Alegre to Leopoldina.

The gross receipts of all the lines during 1889 amounted to $ 2.582.514, the working expenses being $ 1.941.450: the profits were $ 641.064 oa 1.96 %.

By decree dated 6th September 1890 the transfer to the Leopoldina Company was authorized of the concessions for the Carangola and Baron de Araruama Railways. The first named line is of the meter guage and has 223 kilometers open to traffic, viz:, 164 kilometers in the main line, 21 kilometers in the Itapemirim branch, and 38 kilometers in the Patrocinio branch. It has a guarantee of 7 % on a capital of $ 3:276.000. The Baron de Araruama Railway

has 27 kilometers open to service and 66 1/2 kilometers under construction, and has been granted a guarantee of 6 % on a fixed price of $ 16.380 per kilometer. Its gauge is 0.65 meter, it starts from Triumpho and should communicate in Macaco with the Leopoldina Railway.

The length of 27 kilometers between Triumpho and Ventanua was inaugurated on August 17th 1891; so that at that date the Leopoldina Company had 1.430 kilometers 855 meters of line opened to public service.

The newer lines worked by the Leopoldina Company in the State of Minas Geraes run through districts of great fertility although little advanced; at present they absorb a great part of the profits earned by the old lines, but this is a state of things that will pass away, because the industrial and commercial development afforded to these districts, so full of life in themselves, by the facilities of communication and immigration, will in a short time free the older lines from the assistance which at present they have to afford the newer ones, and, like the lines in the State of San Paulo, their profits will become highly remunerative. This railway system has an undeniable future, and it will not be long before facts justify its importance.

Recife and Palmares Railway.—This line, which is situated in the Province of Pernambuco, was authorized on August 7th 1852 and is the property of The Recife and San Francisco Railway Co. Ltmd. formed in London, and legally registered by the decree of October 13th 1853. It has a guarantee of 7 % on $ 5:823.003, and of 5 % on $ 2:351.071.

The construction was begun on September 7th 1855 and on February 8th 1858 the first section of 32 kilometers was opened to traffic; followed by the second of 26 kilometers on December 3rd 1860, the third of 38 kilometers

in 1862, and the fourth of 29 kilometers in November of the same year. The line has thus a total length of 125 kilometers open to traffic throughout; it is of 1.60 meter gauge, with curves of 400 meters minimum radius and maximum grades of 1 1/4 %; the rails used on the line weigh 37.190 and 39.670 kilograms per lineal meter.

The increases in the general receipts of the line have been materially reduced by the losses entailed through the depreciation in the currency being charged to working expenses.

The following statement will show the general returns from the year 1887 to 1891 inclusive:

YEAR.	RECEIPTS. $	EXPENSES. $	PROFIT. $
1887	643.133,58	400.125,18	243.008,40
1888	680.812,86	314.769,00	366.043,86
1889	554.850,66	310.859,64	243.991.02
1890	561.713,88	326.846,52	234.867,36
1891	706.442,10	481.697,58	224.744,52

The traffic in this last year (1891) was transported by 6245 trains which ran 381.777 kilometers and carried 403.263 passengers, 1280 tons of luggage and parcels, 130.782 tons of merchandise and 6332 animals. The net profit on the total capital of $ 9.073,359 (representing the cost of the line including solling stock) was 2.47 %.

Macahé and Campos Railway.—This line was authorized by the Province of Rio Janeiro on February 3.rd 1870 and the Company's existence was legally recognized by the decree of October 18.th 1871. The construction was begun in March 1872 and on June 13.th 1875 the whole distance from Macahé to Campos, 96 kilometers, was opened to traffic. This Company also acquired later on the line from San Fidelis to Santo Antonio de Pàdua 93 kilometers

but this is divided from the Macahé Campos line by the Campos-Fidelis line belonging to another Company. The two lines mentioned have a total length of 189 kilometers open to traffic, the section from Macahé to Campos being of 0.95 met. gauge and the section to Pádua of one meter.

The average cost of the two lines, including rolling stock, is calculated at $ 52.509 per kilometer; this high figure is due to the numerous bridges and long embankments that it has been necessary to construct in order to cross the low lands subject to floods for a great distance along the Macahé-Campos line.

The Company also works the steam navigation between Macahé and Rio Janeiro. but as this business does not form part of the work on which we are engaged, we shall only deal with the railway transactions.

In 1887 the gross receipts of the lines were $ 640.131. the working expenses $ 348030, leaving a net profit of $ 301101, equal to 3 % on the gross capital of the line.

The Principe del Gran Pará Railway. This is the old Mauá line, the oldest of the Brazilian railways, increased by the section ascending the Petropolis mountain and its extension.

The Company formed for the purchase of the Mauá line and to make the new constructions was legally recognised by the decree of May 31st 1881. The old line from Mauá to the foot of the Petropolis mountain, 16 kilometers long, was of 1.68 meter, gauge but the new Company have reduced this to 1 meter, the gauge adopted for the new section and extension. The line has a total length of 92 kilometers open to traffic since 1887.

The only part of the line of importance on account of its engineering difficulties is the mountain section where the Riggenbach system is employed. In this section, which

is 6028 meters long, there is a difference in level of 841 meters; the gradient is 15 % and the minimum curve radius is 150 meters; the rack rail weighs 50 kilogrammes per meter and the ordinary rails 20 kilogrammes. The Riggenbach engines have 1.05 m. driving wheels, cylinders of 500 milimeters stroke, and boiler heating surface of 56 square meters. Newer and more powerful locomotives have been since constructed for this Railway by the Baldwin Locomotive Works of Philadelphia, U. S. A. In this rack section, there are some very important works of art, notably large sustaining walls and a viaduct 60 meters long and 24 high.

The whole line of 92 kilometers is handed over to traffic: in 1887 it carried 101.199 passengers and 34.263 tons of goods. The receipts were $460.619 and expenses $ 285.849, which gives a profit of $ $ 174.770 or a little more than 5 % on the cost of the line, including rolling stock, stations, etc:

Western Minas Railway. The concession for this was granted by the province of Minas Geraes by a contract dated 30th April 1873. The Company owning it is called the "Companhia da Estrada de Ferro do Oeste" and was legally recognized by decree dated July 20th 1878. The line joins the Central Brazilian Railway at the Sitio station, beyond the mouth of the Mantiqueira range; and runs towards the city of San Juan del Rey and to Oliveira, and from the Mourão station a branch runs to Lavras de Famil, all in the State of Minas Geraes.

There should now be 377 kilometers in working, which have been constructed of 0.76 m. gauge, this being the first case in Brazil in which such a narrow gauge has been used for so long distances. All the rolling stock employed is American; the line has numerous though small works

of art; the rails used are Vignolles section of 17 kilogrammes per lineal meter, and the engineering features of some of its sections are the following:

Extension from San João d' El Rei to Oliveira

Total length	178 klms.	
Length in curves	77.500 "	45 %
" on the straight	94.500 "	55 "
" " slopes	33.000 "	19 "
" " counter-slopes	22.000 "	13 "
" " the level	117.000 "	68 "
Minimum curve radius	75 m.	
Maximum gradient	2 %	

Branch to Lovras (Rio Grande.)

Total length	48 klms.	
Length in curves	18 "	37.5 %
" on the straight	30 "	62.5 "
" " slopes	2 "	4.5 "
" " counter-slopes	16 "	33 "
" " the level	30 "	62.5 "
Minimum curve radius	75 m.	
Maximum gradient		1.5 "

The average cost of these lines was $ 7.500 per kilometer, and on the first part (Sitio de San João d'El Rei) the Company was granted a subvention of $ 4914 kilometers for the expenses of construction and primary installation; the extension from S. João d'El Rei to Oliveira and its prolongation and the branch to Lavras have a guarantee of 7 %, all of which have been granted by the Minas Government.

The adoption by the Western Minas Railway Company of the 0.76 m. gauge proves to be the most rational solution

for districts which, on account of their scanty population and the embryo state of their commerce, cannot at first give greater returns: under these conditions, a railway of one meter gauge, costing on the average $ 15.000 to $ 18.000 per kilometer, would be a long time without earning amything proportionate to the capital invested, while the line of which we are treating has already produced, in the year 1887, 5.33 % on its capital.

The curves, as we have observed, come down to 72 meters radius, and the maximum gradients are 2 %. The engines are of two driving axles with a weight of 5.200 kilogrammes on each, and leading wheels with 3.200 kilos weight, the cylinders are 250 millimeters in diameter with 400 millimeters stroke; the total weight, when ready for the road, is 13.600 kilogrammes; and the tender holds 3400 litres of water. As we have said, the vehicles are all of the American (bogie) type, which allows of greater space being given to the bodies, and more advantageously establishes the relation of capacity to dead weight.

In 1887 this line had 218 kilometers opened to traffic, it carried 22.778 passengers and 14.516 tons of goods, the gross receipts were $ 158.368 and working expenses $ 71.153, giving a net profit of $ 87.215, equal to, as above said, 5.33 % on $ 1.635.000, the estimated cost of the 218 kilometers, including rollingstock.

By decree dated October 16th 1890, the Western of Minas Company was granted a concession to extend its line from the Perdões station, on the one side towards the city of Catalão in the State of Goyaz and on the other sido towards the most convenient point between the Comercio and Barra Mansa stations on the Central Brazilian Railway, in the State of Rio de Janeiro: the Company also had the option of constructing the line to Catalão in such a manner that,

passing through Araxa, or its vicinity, it should form a junction with the Mogyana Railway.

Besides the concession of fiscal lands to the Company in the neighborhood of the line and other favors, the above mentioned decree granted a guarantee of 6 % per annum for 30 years on a maximum price of $ 16380 per kilometer of line equipped and ready for handing over to public service.

The Western Minas Company's lines and its extensions were declared of public interest, the Federal Government assuming the responsibilities entered into by the Minas Geraes Government.

Important railways which have not yet passed through their critical period. Having detailed the Brazilian Railways, which are already in a prosperous condition, let us now consider those important lines which do not as yet give a return in proportion to the capital invested. This part of our task would be very painful, had we not the most unbounded faith in the future of these Companies, whose destiny it is to carry the innumerable products of a soil which has been extraordinarily favored by nature. They must all pass through their first period, a difficult one for nearly all the railway lines of the new world, which are not going to supply the necessities of an already developed life, but which are going to create it, fulfilling the mission of civilization emtrusted to them as agents of progress in modern life.

We will begin with the State lines, concluding with those belonging to private Companies, but will only, in both cases, treat of the more important.

Baturite Railway. This Railway is in the State of Ceará; it was constructed by a private Company, but was

redeemed by the National Government, under whose auspices the line has had a relatively important development.

A sentiment of humanity gave rise to the acquisition of this line by the State: in 1878 the old Province of Ceará passed through a terrible period, this beautiful district being harassed with a frightful drought; the populace were abandonning it or were uniting together around the capital where the aid sent by Government, with a care that did them honor, could the sooner arrive; the productions of the province had become exhausted and tillage was impossible for want of water. In this state of things, the Government endeavored to maintain in the starving population the habit and feeling of work, inducing them to look on the aid so prodigally given, not as alms, but as compensation for lost labor.

The Baturite line had not then more than 40 1/2 kilometers open to traffic and was in very precarious circumstances. The Government redeemed the concession and ordered that the line be extended for its own account. The works were actively pushed on, and in them a great part of the population found a means of subsisteace. In 1881 the main line from Fortaleza to Baturite and the branches from Alfandega and Maracamahu to Maraugüape were 109 kilometers 482 meters long; from that date to December 31st 1890 only 45 kilometers 440 meters were built, but, the works being accellerated, the line had on January 1st 1892 197 kilometers 631 meters open to public service, divided has follows:

Main line—Fortaleza—Baturité—Quixada	157	km.	489m.60
Marauguapé Branch	7	"	141m.40
Alfandega	2	"	900m.

The line from Quixada to Quixeramobim is being

constructed, and crosses the granite ridges surrounding the first named city, which is situated on the bank of the river Satia, an affluent of the Banahuihú; it passes between the Urucú and Negra ranges and follows a great plain between the Sipó and Cachoeira ranges towards the city of Quixeramobim, situated on the bank of the river of the same name.

The financial results of this line for the five years from 1887 to 1891 were has follows:

YEARS.	RECEIPTS.	EXPENSES.	PROFIT OR LOSS.
1887	$ 176.467	$ 160.479	$ 15.988
1888	—	—	—
1889	—	—	—
1890	—	—	—
1891	—	—	—

The receipts from this line barely cover the working expenses; it is true that the State, on undertaking its construction, did not do so with views of immediate profit, but with the charitable idea of aiding a people who were harassed by the horrors of an unprecedented drought, but in the future this will be fully repaid, and the State will be fully reimbursed for the sacrifices it has made in this district.

The line is of one meter gauge, with gradients of up to 1.8 %, curves of 120 meters radius, and rails weighing 22 1/2 kilogrammes per lineal meter.

Comocim, Sobral and Ypú Railway. This Railway was constructed by the National Government in the State of Ceará under the difficult conditions already spoken of as existing in the case of the Baturité Railway. Its construction

has been effected in two large sections, one from the port of Comocim to the city of Sobral and the second from Sobral to Ypú. The works were commenced on the 14th September 1878, and on December 31st 1882 the line as for as Sobral was inaugurated.

The principal works entailed in this section by the preparation of the road-bed were as follows:

Amount of earth moved	615.158	cub. met:
" " loose stone	64.915	" "
" " rock moved	28.565	" "
Various brickwork	15.718	" "
Stonework	695	" "

The line from Comocion to Sobral is 128 kilometers 920 meters long, divided as follows:

Comocim	to Granja	24 km.	425 m.
Granja	" Angico	19 "	355 "
Angico	" Pilombeiras	35 "	353 "
Pitombeiras	" Massapé	27 "	187 "
Massapé	" Sobral	22 "	600 "
		128 km.	920 m.

The cost of the line was $ 1.914.705 or $ 14.842 per kilometer.

The engineering features of this section are the following:

Gauge	1 m.00
Maximum gradient	0.018 m. p. met:
Minimum curve radius	181 m. 030

Percentage of straight line	56.347 %
" " curves	43.653 "
" " level line	29.852 "
" " line on slopes	39.976 "
" " " " counter slopes	32.172 "
Width of the road bed in cuttings	4 meters.
" " " " on banks	3 met: 600.
Rails (weight per lineal meter)	22 kil. 500 grms.
Sleepers	1m.80×0m.18×0m.13
Bridges of from 10m. to 110m	10
Small bridges, 2 to 5 meters	64
Closed culverts of less than 2 met:.	125
Open " " " " 2 "	56

The number of buildings, including stations, stores, offices, and dwelling houses is 68.

The rolling stock is composed of:

Engines	5
1.st class passenger coaches	2
1.st and 2.nd class passenger coaches (bogie)	2
2.nd " " "	7
Luggage vans	2
Boxcars	16
" (bogie)	2
Cattle trucks	4
Wagons with tarpaulin covering and open (bogie)	13

The line is worked at a loss, the receipts in the years 1881 to 1891 inclusive being $ 394.686 and expenses $ 714.938, so that for the eleven years a loss of $ 320.352 is shown for the section from Comocim to Sobral.

The works for the extension of the line from Sobral to Ypú were commenced on the 24th January 1889, the length of line between these two points being 87 kilometers 640 meters, with the following technical features:

Maximum gradient	0m.018 p. met:
Minimum curve radius	181m.03
" straight stretch	50.75 met:
" level	200.00 "
Length of level line	46.81 %
" " curved	82.24 %

The works of art projected consist of 12 bridges, 10 of less than ten meters, and 202 culverts.

The estimated movement of earth is the following:

70 % in earth	459.697 cub. met.
20 " " loose stone.	131.342 " "
10 " " rock.	65.671 " "
Total. . . .	656.710 cub. met.

The cost of the 87 kilometers 640 meters comprising the extension has been estimated at $ 1.345.835 equal to $ 15.293 per kilometer.

On the 1st January 1892 the road-bed of this second part of the line was already prepared for laying the rails, so that at the present time the construction of the line to Ypú ought to be finished: the length of the whole line from the port of Comocim to that place will be 46 kilometers 560 meters.

Southern Pernambuco Railway. This railway also belongs to the State: it starts from Palmares and forms an extension

to the River San Francisco of the line of 1 m. 60 gauge belonging to the Recife and San Francisco Railway Company Limited.

On the 1st January 1892 the part constructed and open to public service of this Railway amounted to 146 kilometers 420 meters, the works having been inaugurated on 24th December 1876. Its gauge is one meter, the maximum gradients are 18 °/₀₀, the minimum curve radius is 150 meters, and the weight of the rails 25 kilogrammes per lineal meter.

The surveys of the extension of 500 kilometers to the River San Francisco have been approved and are ready for the works to be commenced. The line between San Francisco and Palmares will be 646 kilometers long and to the port of Recife 771 kilometers.

The 146 klm. 420 met. already constructed are worked at a loss. The center of the State of Pernambuco may be said to be still virgin soil, and as the mission of these railways is to attract population and foment industry and commerce, it would not be reasonable to expect profits of any kind in their early days; loss has of necessity to be incurred; seeming loss, however, which the State will make up for by the increased income which will be produced by the handing over to work and civilization of districts which are bounding with life, and which, up the present, have not contributed to the State's general receipts.

Under such conditions as these it is only the Public Powers who can initiate and carry out works, the realization of which is really of National interest, or by means of subventions or guarantees of a minimum rate of interest, can encourage the investment of private capital in undertakings of this nature.

In 1891 the gross receipts of this line were $ 125602 and the working expenses $ 315.588.

Prolongation of the Bahía Railway. This line belongs to the State and, forming an extension of the line between Bahía and Alagonhas, penetrates into the interior of the State of Bahía in the direction of Joazeiro, situated on the right bank of the River San Francisco. Its gauge is one meter and its technical features comprise maximum gradients of 18 ‰, minimum curve radii of 153 meters, and its rails weigh 22 1/2 kilogrammes per lineal meter. Its construction was commenced on the 25th October 1877; on the 18th November 1880 the first section, 111 kilometers long, was opened; on the 6th February 1886 there were 227 kilometers 959 meters open to public service, and at the end of 1888, 321 kilometers 996 meters. The construction of the remaining 131 kilometers 600 meters to Joazeiro has been continued, and in 1891 was well advanced, so that it should be now completed and open to traffic. The length of the line from Bahía should be therefore 453 kilometers 596 meters.

This railway is also worked at a loss; in 1891 the gross receipts were $ 168.507 and the working expenses $ 399.792. In order to understand the idea governing the construction of this railway and the preceding one, it is necessary to know the configuration of the country and the ordinary means of transport in each district giving communication between the coast and the interior. Brazil has been repeatedly compared to a large ham in shape. This comparison is by no means inopportune, as will be at once observed on looking at a map of South America. Its extremity is near the Equator; its widest part is in the Provinces of Pernambuco and Bahía, and from thence it gradually narrows down to its Southern frontier. In its northern end the great Rivers Amazon, Tocantino, Paranahyba, Madeira, & with their numerous branches, afford natural means of

transport between the interior and the coast, so that there the Railways are only accessories or are only necessary to the more or less narrow districts between these large rivers. In the South, the comparative narrowness of the country also allows of ordinary communication with the coast and with the River Paraná, which is the inland boundary of the country. Further-more these States, as also that of Minas Geraes, which is in that district, have more quickly attracted private enterprice in the shape of Railways, having devoloped more rapidly than the Northern States.

With the exception of the districts bordering on the coast. the wide part of the ham has, on account of its width, been more abandonned: it has, however, been necessary to place these districts, situated so far from civilization and its attendant benefits, in direct and rapid communication with the Atlantic, and to attain this object it has been necessary to construct great railways, not in the character of industrial undertakings, because much time must elapse before they can become such, but as a true *instrumentum regni*, and it is only the State that can carry this into effect.

From this sprang the idea of the two prolongations from Bahia and Pernambuco to the River San Francisco: this district is a new world which these two lines will open to progress and civilization; and the country will feel the advantage before the capital employed in their construction returns any profit. Such as these are the only lines which, in this age of private enterprise, can be admitted as State lines.

Porto Alegre and Uruguayana Railway. This is the most southerly of all the lines belonging to the Nation. It is situated in the State of Rio Grande del Sud, at the

extreme South of Brazil, and adjoins the Plate and Paraguayan Republics. Surrounded by foreign countries, the Brazilian Government is carrying out the construction of this line in obedience to the strategic plan of communication laid down for this State.

This consideration, as well as the financial side of the question, has induced it to give preferential attention to railway communication in this district, by constructing lines for its own account, or by granting concessions to Companies.

The line with which we are now dealing starts from Tacuary, from which point there is water communication with Porto Alegre, and crossing the State from one end to the other, a distance of 631 kilometers 785 meters, will terminate in the frontier city of Uruguayana. Its construction was commenced on the 23rd December 1877, and on the 1st of January 1892 there were open to public service 377 kilometers, or as for as Cacequy, and the remaining 254 kilometers 785 meters of the line to Uruguayana were in construction, as well as 205 kilometers 843 meters of the branch from Cacequy to Bagé.

359 kilms. 629 met. of the road-bed were concluded and the remaining 101 kms. in preparation.

The expense incurred in the banks and cuttings was $1.874.921.

Of the 1256 works of art projected, 716 are ready for final measurement, 166 are being constructed, and 344 are ready to be commenced. The total value of these works was $ 1.124.574.

Through the ports of Rio Grande, Porto Alegre, Margen del Tacuary, and Paysandu in the Uruguayan Republic 12.028 metric tons of material for the permanent way and iron bridges, engines and telegraph material were received; the cost of transporting all these was $ 129.838.

The part of this railway opened to public service is worked at a loss, its gross receipts in 1891 being $ 459.950 and working expenses $ 533.671.

The line is of 1 meter gauge with curves of up to 120 meters radius and gradients of 18 °/₀₀: the rails weigh 20 1/2 kilogrammes per lineal meter.

In the year 1890 a branch of this line from Laycan to Santa Aua do Libramento was suveryed; the shortest route resulting from the various trials made was 138 kilometers 842 meters long.

Bahia Central Railway. This line, situated in the State of Minas Geraes, was granted by decree dated January 14th 1866; in January of the following year the Paraguassú Steam Train-Road Company Limited was formed in London to carry out the construction of the line, to which the Province of Bahia contributed by subscribing a part of the capital; but the Company was short-lived, as two years later it went into liquidation on, and on the 26th September 1872 the line passed into other hands. The new company receives a guarantee of 7 °/₀ which 'was granted it by the State under a decree dated 28th October 1874. The line is of one meter gauge, with curves of up to 120 meters radius, and gradients of up to 33 °/₀₀, and the rails weigh 20 kilógrammes per lineal meter. The difficulties undergone by the first Company, and those which hindered the formation of the second, as also the long preliminaries gone through in modifying, improving and defining the terms of the concession, did not allow of the necessary impulse being given to the works from the beginning, so that not until the 7th April 1875 could there be handed over to public service a length of 43 kilometers, which did not even constitute a section of the main line, but was only a branch The works of the main line were commenced on May 17th.

1879, the first 84 kilometers of the same being handed over to traffic on the 23rd. December 1881; on 15th. October 1883 a second section of 96 kilometers was opened; and on January 15th. 1885 a third section of 63 kilometers. In 1887 the Company were working 299 kilometers including the branch of which we have already spoken, and in 1890 the length of line, completely finished and handed over to traffic, was 315 kilometers.

The main line starts from the city of San Felix, runs through the Chapada Diamantina, and penetrates into the heart of the State of Bahia. The branch goes from the city of Cachoeira to that of Feira de Sant'Anna, all in the same State.

This Railway which, as we have just seen is of recent date, cannot for the present give large profits but this is only a question of time.

The gross receipts from 1888 to 1890 inclusive were $ 957.526 and the working expenses in the same period were $ 910.613.

Bahia-Minas Railway.—This Railway, starting from the port of Caravellas, in the State of Bahia, crosses the latter as for as the Aimorés mountain range and enters into the State of Minas Geraes: iis terminating point will be the city of Teófilo Ottoni, also called Philadelphia.

The construction of the line has its origin in the laws of the Legislations of Minas Geraes and Bahia, dated respectively 25.th October 1878 and 28.th August 1879; each of these States granted a subvention of $ 4.914 per kilometer of line constructed in its territory, but that granted by the first-named was replaced in 1888 by a 7 % guarantee.

The line is of one meter gauge with minimum curves of

107 meters radius, maximum gradients of 2 1/2 %, and rails of 18 kilogrammes per lineal meter. On the 1.st of January 1888 there were 142 kilometers being worked and 251 in construction. The part open to traffic is the least paying part, and it will only be when the section now being built in the Province of Minas Geraes is handed over, that the Company will see realized the brilliant future that is reserved the it.

In 1887 the gross receipts were $ 118.644 and the working expenses were $ 76.154; giving a profit of $ 42.490 or 1 1/2 % on the cost of the part opened to traffic.

Minas and Rio Railway.—This concession was granted by the Province of Minas Geraes on the 22nd. February 1875, with a guarantee of 4 %, to which was added 3 % granted by the National Government. who later on took on themselves that granted by the Minas Geraes Legislature.

The line is of one meter gauge, has minimum curves of 80 meters radius, gradients of up to 3 %, and rails of 20 and 25 kilogrammes per lineal meter. It communicates with the Central Brazilian Railway at Cruzeiro station, in the State of San Paulo, through whose territory it runs for 45 kilometers, and penetrates into the State of Minas Geraes, into a district of great future on account of the fertility of the soil. The construction of the first section was very difficult, being situated in the mountain range, and it was necessary to carry out very costly and arduous works, the principal of which are: a tunnel at kil: 13, 22 meters long, another 27 1/2 meters long at kil: 20, a third 19 meters long at kil: 21, and shortly after, the most important work of the whole line, viz: a tunnel 996 meters long, 909 meters of which are cut through the solid rock

and the remaining 87 are lined with brickwork; in this first section, there is also, at kil: 30, an iron viaduct 28 meters long.

After ascending the mountain range, the line runs through comparatively easy valleys, and the further it goes, the more the cost per kilometer, which in the first section was very high, diminishes.

The works commenced on April 21st 1881, and on the 14th July 1884 the whole line, 170 kilometers long, was finally handed over to traffic. Its prolongation is now talked of as well as several branches.

The concession granted to the Minas and Rio Railway Company for the construction, use, and enjoyment of the prolongation of its line to the navigable point of the Rio Verde, as also of a branch to the city of Campanha, having been declared lapsed by decree dated May 23rd 1890, tenders were called for the construction of these lines, contracts for which were, by decree of October 11th of the same year, entered into with the Muzambinho Railway Company.

The final plans of the branch to Campanha, 58 kil. 600 met. long, were approved by decree dated July 13th. 1891.

The capital employed in the construction of the 170 kilometers, including rolling stock, was $ 8.460.412, on which there is a guarantee of 7 %; the average cost per kilometer is, therefore, $ 49.767.

An examination of the returns for the period 1887 to 1891 shows a constant increase in the gross receipts, although the profits have not increased in like proportion as will be seen by the following table:

YEARS.	LENGET OPEN TO SERVICE.	REGEIPTO.	EXPENSES.	PROFITS.
1887	klms. 170	$ 398.137	$ 272.186	$ 125.951
1888	" "	393.835	280.037	113.798
1889	" "	440.146	285.820	154.326
1890	" "	503.777	398.405	105.372
1891	" "	596.613	448.975	447.638

Sorocabana Railway.—The construction of this line was authorized by law of the Legislature of San Paulo dated 24th. March 1870, and, by a contract celebrated with the same State on 18th. June 1871, it was granted a guarantee of 7 % per annum. The section which enjoys this favor is 128 kilometers long and runs from the city of San Paulo to Villeta: the sections from Villeta to Boituva 34 kilometers long, from Boituva to Tietê, 24 kilometers, and the branches from Boituva to Tatuhy and from Cerquilho to Botucatú, 46 and 110 kilometers in length respectively, have no guarantee. The extent of line open to traffic is 342 kilometers.

By a decree dated November 24th. 1888 the Sorocabana Railway obtained, besides other favors, a guarantee of 6 % for thirty years on the capital to be employed in the extension of its lines up to a maximun price of $ 16380 per kilometer. The extensions should be from Botucatu to a convenient point on the right bank of the River Paranapanema, below the confluence of the Tibagy, and from Tatuhy, in the State of San Paulo to a convenient point on the border of the State of Paraná, passing through the cities of Itapetininga and Fáxina: the point chosen on the borders of the two States was Itararé.

The final plans of these extensions were approved by

decrees dated 3rd December 1889 and 18th October 1890, and the term for finishing the works was prolonged from 3 to 5 years, after the plans were approved, by decree of 9th October 1890.

The extensions, which are being constructed, are:

From Botucatu to Tibagy.	470 km. 700 m.
" Tatuhy to Itarare	306 " "
Total.	776 km. 700 m.

The construction of the first named extension was commenced on the 4rd June 1891 and of that to Iterare on March 31st of the sanne year.

Besides this concession, the Sorocabana Railway were granted another for a line from S. Jaoa to Santos, with all usual favors, except guarantee. This line is being surveyed and should be about 200 kilometers long.

When this line has completed its system, it wil be 1.316 kilometers long, and, on account of the important districts through whinch it pass, and its junctions with the railway systems of the States of San Paulo, Rio de Janeiro and Minas Geraes, and with the lines projected in the State of Paraná, it will be one of the most important railways in Brazil.

With respect to the trafñc moved by the line, it has only been possible to obtain data up to 1887. In that year with 222 kilometers open to service, 56437 passengers and 28771 tons of goods were carried, the gross receipts being $ 417.864 and working expenses $ 272.565, giving a a profit of about 3 %.

Paraná Railway—This concession belongs to a Company organized in France under the name of "Compagnie

Générale des Chemins de Fers Brésiliens. This somewhat pompous title is liable to produce errors, as the Brazilian Railways generally are not treated of, but, to speak more modestly, one railway in Brazil. The concession was granted by the Province of Paraná on November 20th 1872 and bears a State guarantee of 7 %.

The construction of the line was commenced on June 5th 1880 and on the 17th November 1883 the first section of 41 kilometers was handed over to traffic. In 1887, the whole line of 110 kilometers was in working. It is divided into three sections, each one of which is different from the others on account of its technical features.

The first section is 40 kilometers 930 meters long; the maximum gradients are 0 m. 0.10 per meter, and their total length is: on the rise, 2 kilometers 637 meters, and on the fall, 2 kilometers, 888 meters; there are, in this section, 17 kilometers 452 meters on gradients and 43 kilometers 478 meters on the level. The length of maximum gradients are: on the rise 750 meters, and on the fall, 700 meters. The minimum curve radius is 200 meters. The total length on the curve is 7 km. 174 met; in curves of minimum radius, 1 km. 560 m., and on the straight 31 kilometers 756 meters. The gradient part of the line is 42.6 % of its length; and the part in curves 22.4 %.

In this first section there are four stations: Paranaguá, the starting point, 5.60 m. above sea level; Puerto Don Pedro II. at kilometer 2, 4.20 m. above sea level; Alexandra, at kilometer 16, 10.50 m. above sea level; Marrotes, at kilometer 40.800, 9.50 m. above sea level.

Of the second section, 45 kilometers 458 meters long, the initial point is 9.50 met. and the terminal 898.13 met. above sea level, the highest point, at kilometer 80, being 954.63 met. above sea level. The maximum gradients are:

on the rise 0 m. 0.30 per meter and 0 m. 0.17 on the fall. The total length of maximum gradient is 23 klm. 431 met. on the rise and 2 klm. 0.95 met. on the fall. This section has 41 klm. 255 met. of gradient and 4 klm, 204 met. of level line, the former being 90 % of the whole section. The minimum curve radius is 100 meters. The length of the curves is 23 klm. 382 or 51.5 % of the whole section. There is only one station, Port de Cima, at kil 50.600, 232.60 met. above sea level. The works of art are:

Tunnels.	16
Bridges and viaducts. . . .	41
Culverts	30
Drainage pipes	165
Sustaining walls	96

The 15 tunnels, which have been almost all perforated through solid rock, measure together 1710 meters long. In this part of the line the greatest difficulties have been encountered, the banks and cuttings exceeded 50 cubic meters per lineal meter, of which about a third part was in stone; 96 sustaining walls were built of about 3 kilometers in length altogether, and with about 19 cubic meters to the lineal meter.

"The works" (according to the President of the old province of Paraná) "are most important and it will be "difficult to find more remarkable in Brazil; sustaining "walls are followed by tunnels and the latter by viaducts. "The passage between the San Juan and Ipiranga valleys "is magnificent, and it is a pity that such a beautiful "district is not adapted to agriculture. The railway line "is always rising, leaving house after house behind in the "depth of the valleys but only in the place called "Ipiranga, where a station has been built, is there a small "nucleus of population."

In the third section, which is 24 kilometers long, the maximum gradient is 0 m. 0.17 per meter, of which there are 1 klm. 869 met. on the rise and 440 met. on the fall. There are 13 klm. 362 met. in sundry gradients and 10 klm. 632 met. on the level, the former being 55. 6 % of the length of the section. The minimum curve radius is 150 meters, of which there are 257 meters: the length of curved line is 7 klm. 874 met. or 32. 8 % of the section. The highest point, Cajurú, at kil. 106.500, is 624.90 met. above sea level. In this section there are two stations: Piraguará, at kil. 87, 896.43 met. above sea level, and Curytiba, at kil. 110.500, 895.46 met. above sea level. There are also the following work of art:

Bridges and viaducts	9
Culverts	8
Drainage pipes	8

The products of the district served by this section are yerba mate, timber and grain, the ground being suitable for the cultivation of wheat.

The gauge adopted in this line is one meter, and as we have above indicated, the maximum gradients are 0m.0.30, and the minimum curve radius is 85 meter.

The construction of the line between Paranaguá and Curytipa, has cost more than that of any of the lines built in Brazil, the cost per kilometer, including rolling stock, being about $ 91.000.

At the present time the extension of the line across the high plateaux of the State of Paraná is being carried. This extension will be of the greatest importance, both for the Company and the State, which guarantees a minimum rate of interest, as also for the districts traversed, which are now destitute of cheap and rapid means of transport and cannot therefore make use of their riches.

On the 1.st of January 1892 the general condition of the line was as follows:

LENGTH OPEN TO TRAFFIC.

Paranaguá to Curytiba . . .	kil.	111.000	
Curytiba to Lapa	"	120.000	klm. 231.000

IN CONSTRUCTION.

Morretes to Antonina . . .	kil.	17.000	
Lapa to the Rio Negro . .	"	60.000	
Bifurcacion to Puerto Amazonas	"	61.240	" 138.240

SURVEYED.

Restunga Seca to Punta Grossa	"	72.220
Total. . .	klm.	441.460

The amount of capital invested in the construction of the line from Paranaguá to Curytiba including rolling stock, is estimated at somewhat more than $ 10.000.000, but the capital on which the guarantee of 7 % is paid, only amounts to $ 6.271.654. The extensions towards Antonina, Rio Negro, Puerto Amazonas and Punta Grossa have a guarantee of 6 % on the capital that may be invested in them, up to a maximum of $ 16.380, which was granted by the decrees of January 5th 1889 and 18th October 1890.

The final plans of the branch to Antonina and of the extensions to Rio Negro and Puerto Amazonas were approved by decrees dated 21.st September and 6th November 1889.

The works of the Antonina branch were commenced in June 1891, but due to modifications it was necessary to make in the route, and the considerable works executed to

protect the line from the waters, it was still being constructed at the end of 1891; but the branch should be ready for traffic in April 1892. In this branch the average cost per kilometer was $ 20.010; in the extension from Curytiba to the point of bifurcation with the line to Lapa and Rio Negro, 71 klm. 760 met. long, the average cost was $ 21.992; from the point of bifurcation to the city of Lapa, 50 kilometers, the cost was $ 16.926. These two last lines were opened to traffic on 18th November 1891, and one of the principal products which they carry is yerba maté in the rough, the quantity exported being sufficient to give the line a considerable income.

The financial condition during the five years from 1887 to 1891 of the line from Paranaguá to Curytiba has improved year by year. The following statement will give the movement during that period.

YEARS.	LENGTH OPEN TO TRAFFIC.	RECEIPTS.	EXPENSES.	PROFITS.
	Klms.			
1887	111.000	$ 368.790	$ 301.670	$ 67.120
1888	111.000	410.062	283.723	126.339
1889	111.000	421.206	292.143	129 063
1890	111.000	471.373	319 639	151.734
1891	111.000	535.817	291.351	244.466

As will be seen the profits have gradually increased, and it is to be hoped they will do so still more when the new extensions are opened to traffic.

Rio Grande and Bagé Railway. The concession for this railway was granted by the province of Rio Grande del Sud on the 11th of August 1871 and a Company, called the Imperial Railway Company of Rio Grande del Sud, was formed in France to construct it with a capital of

$ 7.382.712 which, by decree dated October 26th 1878 was granted a guarantee of 7 % for 30 years in accordance with the terms of the law of September 10th 1873.

Later on, by government resolution of 17th February 1882, the French Company was authorized to transfer its concession to the English, who have more confidence than the French in foreign undertakings and know better how to sow in new countries in order to reap later on. The new Company which was called the "Southern Brazilian Rio Grande do Sul Railway Company, Limited, has carried out the construction of the line from Rio Grande to Bagé.

The line is of one meter gauge, with minimum curves of 120 meters radius, and maximum gradients of 3 %. Its construction was commenced on the 27th November 1881, and on the 2nd of December 1885, the whole line of 283 kilometers was opened to traffic. It is, therefore, a line of very recent construction, and in new countries, the prosperity of railways is not apparent at first; it is therefore passing through the period of difficulty which railways in these countries generally have to bear.

The following statement shows the financial movement of the line in the five years from 1887 to 1891:

YEARS.	LENGTH OPEN TO TRAFFIC.	RECEIPTS.	EXPENSES.	PROFITS.
1887	283	$ 349.123	$ 324.335	+ $ 24.288
1888	283	292.334	326.726	— 34.392
1889	283	303.418	371.842	— 68.024
1890	283	338.602	330.568	— 966
1891	283	373.426	390.117	— 16.691

The State has set on foot the extension of this line from Bagé to Cacequy, a distance of 205 kilometers 843 meters,

which would form a junction at the latter place with the line from Port Alegre to Uruguayana.

This extension will provide the line with greater elements of life, which will undoubledly tend to shorten the period during which it must avail itself of the whole of the guarantee granted by the State.

LEGAL REGIME

In Brazil as in the Argentine Republic the railway concessions have been granted by the National Government or the Governments of the various Provinces, today called confederate states.

The National Government has granted the concessions of of those lines:

(*a*) That would establish communication between two or more of the old Provinces;

(*b*) That would connect the Federal Capital with one or more of the Confederate States;

(*c*) That would establish communication between any part of the national territory with one or more of the border States;

(*d*) That by their general importance in the administrative service do not even pass the borders of one Confederate State.

(*e*) That were to be constructed by the Nation itself.

(*f*) That were an extension ot any National line or of any line conceded by the Nation.

On the other hand the old Provinces (or actual Confederate States) have granted the concession of those lines:

(*a*) That were exclusively of local interest, viz: those that did not run beyond the limits of the State, and

did not encroach upon the district already allotted by any national concession, or belonging to a National line;

(*b*) That were branches of any lines authorized by the National Government or of National property, such branches not to cross the frontiers of the concessionary Confederate State;

(*c*) That were to be constructed for and worked by the Confederate State exclusively within its own territory.

In granting the concessions of these lines there has been no determined plan of legislation, each concession having been made according to the reigning conditions, although generally those of the National concessions have been more or less adopted.

The concessions granted by the National Government are divided into four classes which although more or less similar on the whole, nevertheless widely differ in their details as to term of privilege, property, concessions, and method of fixing capital outlay when there is a guaranteed interest.

These four classes do not form a general group from which the Government makes a choice when granting a concession but they rather represent the successive alterations made in the base of same as induced by experience and by the personal ideas of the governors at different times; it thus results that each concession has been given according to the ideas ruling at the date when made.

To those who would wish to make out a certain confusion in this diversity of plans · we would remind them that as railway concessions generally represent monopolies and favours, the Government fulfil a moral obligacion in modifying from time to time when necessary such regulations with a view to eliminating wherever possible such monopolies and favours as experience may prove advisable.

When even in Europe and North America in the matter of railway concessions the nations are still in the dark it is not to be wondered at that in new countries like the Argentine Republic and Brasil, where, as is natural, the fever of advancement is of a more acute type and where hopes are more ardent, almost all the different systems of concession should have been tried.

These four classes of which we have spoken are:

(1) Perpetual concession; guaranteed interest for ninety years on a capital at first estimated at the maximum, but to be afterwards definitely determined upon the bona fide proofs of the cost of construction up to the maximum cost allowed; privilege of a sixty kilometer district (30 kilometers on each side of the line) for the same term as the guarantee; exemption from import duties on all material introduced for the construction of the line, the workshops, and for their maintenance; exemption from similar duties on the coal required for the use of the road during the first thirty years of working, and other favours of which we will treat further on. Absolute right of redemption after thirty years of being opened to traffic. Such are the stipulations of the law of June 26th 1855.

(2.) Perpetual or temporary concession, in the latter case not to exceed ninety years. and to revert to the Nation at its termination; Guarantee on a capital fixed as set forth in the preceding concession; privilege of a sixty kilometer district (30 kil each side of the line) for the period of the guaranteed term or at the outside ninety years; similar favours to those set forth in the previous concession; absolute freedom from expropriation after fifteen years open to traffic.

This was established by the law of February 18th 1874.

(3.) Perpetual or temporary concession, in the latter case reverting to the Nation on the expiry of the same: guarantee of interest for a maximum period of thirty years; the capital guaranteed to be calculated on the estimated cost after survey, this to be unalterable however much the line should afterwards cost under the conditions originally projected and approved, nevertheless such capital may be increased by the amount of any modifications demanded by the Nation, or if the Company should propose any modifications that would result in an economy on the accepted plan, provided same were made with the approval of the Government, the half of the amount of same would be deducted from the capital, otherwise the whole amount would be thus treated: privilege of a forty kilometer district (20 kil on each side of the line) during the term of the temporary concession or otherwise at the outside for ninety years; exemption from import duties on the material destined for the construction and equipment of the line; similar exemption on the coal required for the use of the line during the first twenty years open to traffic: other favours in common with the preceding concessions: absolute freedom from expropriation for thirty years after the completion of the construction of the line.

Such is the law of August 10th 1878.

(4.) Temporary concession for a maximum term of ninety years; reversion of the line to the Nation at the expiration of the concessionary period; a capital guarantee for a maximum term of 30 years; privilege of a twenty kilometer district (half on either side of the line) during the term of the concession; other

favours as in the third concession; freedom from expropriation for a term to be specified in each concession: absolute right of expropriation on the plea of public utility.

The concessions without guaranteed interest have the same clauses as those with guarantee, with the exception of this particular, as also in the other favours which are only granted when expressly mentioned in a concession.

We have only recited here the principal points of the different types of concessions. reserving for later on the study of the details of same.

From the comparison of the four types mentioned it will be seen:

1. That the duration of the time fixed in the concessions is: perpetual under all those granted under the stipulations of the law of 1852; perpetual or temporary as granted to those under the law of 1874; and still the same under the law of 1878; finally by the law of 1880 exclusively temporary.

At first the want of experience was paid for: later on the new concessions were made on more reasonable conditions; and finally in 1880 these were definitely settled, since which time no perpetual concessions have been granted, it having been made an invariable condition of all the concessions that they were only for certain periods, and whatever may be the regulation of railway concessions in the future they will doubtless always be so granted with reversion to the Nation.

2. The capital guaranteed was fixed in the first concessions by a maximum without the benefit of a subsequent adjustment on the production of bona fide proofs of the expenditure made. Afterwards the capital was fixed

beforehand but in turn this was changed, and it was determined definitely to fix this after construction but without any limit as to maximum.

On this point there is a greater variance of ideas than at the time of the concession, each system in Government circles has its supporters and the question is at present far from being resolved.

It is true that theoretically the doctrine of the law of 1880 is the most reasonable, but is it the most convenient politically?

Here we have only to review the various systems, but if we were allowed to express our private opinion we should say that the capital fixed beforehand under the wise conditionsof the law of August 10th 1878, or the third system, is the most prudent in the interest of the Nation as guarantor.

3. The privilege of a reserved district has been reduced from 66 to 60, to 40, and then to 20 kilometers. This reduction was an absolute necessity for the opening up of the country by railways and to ensure to each district the most convenient and natural outlet.

Further on we will explain what is understood by "privilege of a zone", but as the term is self explanatory in representing a monopoly, it will be easy to comprehend the importance of the reduction in the width of the district thus conceded to each railway.

4. The term fixed for the guaranteed interest service also suffered no less changes, being reduced from ninety years under the first concessions to thirty as a maximum under the law of August 10th 1878, which law also considerably reduced the responsibility of the Nation undea the concessios subsequently granted.

5. The right of expropriation has always been maintained.

We will later on explain how this is exercised but to

balance this privilege the law of 1880 mentions for the first time the right of expropriation on the plea of pnblic utility, although the same right has always been tacitly understood.

In all the concessions the Nation reserved the right to examine and approve the plans, projects and estimates, to demand modifications in same, to determine the nature and capacity of the material. to regulate in accord with the companies the tariffs for transport, to superintend the execution and maintenance of the works and stock, to intervene in the working, establishing regulations for its protection, security and government, to fix periods in which the plans should be presented, the construction of the works begun or their completion terminated, and for the line to be opened to traffic, indeed generally for the control of the Companies that enjoy the State guarantee.

The privileges granted as a general rule by all the concessions besides the guarantee of interest are.

1.st Exemption from all import duties on all the materials and tools necessary for the construction and original equipment oi the line and its workshops.

2.nd The same exemption for the fuel required for the working of the line and its shops during a fixed period.

3.rd The benefits of a special law of expropriation for the land required for the railway line, works, stations and other dependencies.

4.th The gratuitous concession for similar purposes of lands of national property.

5.th The use for the works of the railway of the wood and other materials found on the national lands or commons

6.th The right to use free of charge the public roads for the passage of the line.

7.th The cession at a nominal price of the lands bordering the line for the purpose of establishing colonies thereon.

8.th The preference in equal conditions for the extension of the line or making of branches.

9.th The preference in the working of any mines or water ways existing in the district reserved to the railway.

10.th The recognition as colonists with the grant of the corresponding privileges of all the foreign employees on the line, and also the exemption from military service of all the native employees.

11.th The right to establish abroad the directorate of the Companies, but with a resident representative in Brasil with full powers and personality to respond to the courts of the country for any question referring to Brasil, its subjects or residents with respect to acts having place in Brasil.

12th Payment of the guarantees granted to Companies formed abroad in gold or its equivalent.

13.th The right of arbitration for the adjustment of any questions referring to the interpretation of contracts privileges, or the obligations of the contracting parties.

14.th Exemption from general taxes in common with other companies under the law of 1888; also similar exemption from local and provincial taxes.

15.th Payment of the guaranteed interest by half yearly arrangements on the guaranteed capital by delivery to the Company's banker, who will only pay same in proportion to the requirements of the works, carrying to the credit of the appropriations in the guarantee accounts the payments made by the banker for interest.

On the other hand besides the right of approving the plans estimates and tariffs, and of exercising the control and superintendence etc, besides the other stipulations of of the concessions, the Nation also reserves the right with those Companies enjoying a guaranteed interest, to receive the half of the net profits when these are from eight to

twelve per cent, and to reduce the tariffs when they exceed 12 %.

To complete this review before giving the dispositions in detail of the four laws establishing the four classes of concessions we will mention the various decrees:

1. Of October 27th 1855 regulating the process of the expropriation of the lands required for the construction of the line and its dependent instalations, it establishing a summary procedure for the expropriarions which may be summarised as follows:

The Company in the first place will make a friendly offer to the proprietors or interested parties which if accepted avoids any necessity for the interference of the law; if it should be refused it will then be repeated by judicial citation and within five days the proprietor will be obliged to declare his acceptance or otherwise; if accepted the cause will be summarily disposed of, if refused the proprietor must at once name two arbitrators, the Company another two and the Goverment a fifth. These five will meet under the presidency of the District Judge and will at once proceed to value the lands, taking as a base the prices offered and demanded, and the Judge will ratify the final judgement of the tribunal.

Once the judgement is pronounced, although without the conformity of the owner, the Company will pay into court the amount fixed by the tribunal, and the Judge will by an official delivery make over to the Company the rights of possession of the lands and of prosecuting the works in same. The lawsuit will take its ordinary routine but will not cause any delay to the construction of the works.

2. Of April 26th 1857 regulates the construction, maintenance, working, government and security of the railways. This regulation, by the date in which it was

made, when in Brasil the ideas upon railway matters were very indefinite, demonstrates an intelligent and conscientious study of the European regulations with a foresight that does honor to the Minister who signed it. Later on it was completed, improved in certain clausse, reformed in others but even to day it still forms the basis of them all; and when the day comes for a general revision of all the various dispositions arrived at at sundry times, to complete or interpret same, this decree will still serve as the best foundation for future regulations. It was signed by Dom Luis de Conto-Ferraz.

We will conclude this review by giving the substance with comments of the law of June 26th 1852 in order that the importance of same, from which dates the commencement of railway enterprise in Brasil, should be better understood. When we have concluded this, together with what we have just said on the different classes of concessions it will give an idea of the other various laws without the necessity on our part to lengthem this article with comments on each of them.

Dispositions of the Law of June 26th 1852. This law passed by the General Assembly and promulgated by the decree N.° 641 of June 26th 1852 is the first that established general bases for railway concessions.

The first article

(a) Authorizes the Government to grant a concession for the construction of a railway which shall commence in the city of Rio de Janeiro and terminate in the most favourable peints in the provinces of Minas Geraes and San Paulo.

Under this article the Government by decree and contract of May 9th 1855 granted the concession to the Dom Pedro I Company, after the non fulfilment of other previous

concessions and contracts which were annulled. This first great company was founded in Rio Janeiro with native capital by the Viscount of Rio Bonito, Furqueim de Almeida, Zoa Baptista da Fonseca, Joseph Charles Mayrnich, Meliton Maximo da Souza and Christian Benedict Ottorni.

On July 10th 1865 the Government by friendly arrangement took it over and gave it great impulse. This line is to day the most important of the State and indeed of all the Brazilian lines. The original line is 725 kilometers long with a guage of 1.60 meters, the extensions being of 1 meter guage.

(b) It fixes the extent of the concession to a maximum limit of 90 years.

In the contract for this line, as also for the others under this law, the term for the enjoyment of the various privileges has been fixed at ninety years, the property of the concessions being granted to the Company in perpetuity.

(c) Grants to the Companies the right of expropriation on the plea of public utility; it also cedes the national lands, or those not allotted to anyone, for the purposes of the line, works and dependencies.

Later on the law of October 27th 1855 established special regulations for the expropriation of private lands as we have mentioned above. In addition to the national or unoccupied lands, the Companies in the expropriations from private people were exempt from paying for the value of the ground granted under the old Colonial system gratis, as also of those held under the squatting rights (first occupant). In either of these cases the Company only had to pay to the proprietors the value of the cultivation, constructions or other manual labour. In making the arbitration the valuers must not take into consideration the extra value that the passing of the line would give it.

(d) Allows the Companies to make use of the wood and other materials found on the national or untenanted lands through which the line runs.

This privilege was made in all the contracts made under this law and it was established that the quarries found on the lands expropriated under the terms of the previous article should not increase the indemnization to be paid unless they were actually being worked.

(e) Grants the Companies exemption from import duties on materials introduced from abroad for the construction and equipment of the line, and also on the coal required for the working and shops during a certain period to be stypulated in each case.

(f) Grants a monopoly of the district of 33 kilometers on eithe side of the line for a period of ninety years.

This privilege is granted with the object of ensuring the original lines from competition by new concessions in the district which they opened up. In practice this restriction on new concessions is not taken as absolute, it refers to new lines starting from or arriving at the same place as the primitive one, or which starting from one point of the district served by the older line terminates in another point ot the same district or in its starting or terminating point.

It does not exclude new lines which, beginning or terminating in those same points, aid in their development beyond the district they serve, on condition that they do not establish in the privileged district other stations than those of arrival or departure. Neither does it exclude extensions, convergent junctions, nor transverse lines which cross the primary one with different objects. In a word, the object of the restriction is to ensure to the first line its natural traffic and not a forced traffic, which might

be the case should there exist another exit for produce than that which it affords. Considered in any other light, the privileged zone would be irritating and would become a serious obstacle to the development of the primitive line.

(g) It gives the Government the right to fix the tariffs up to the maximum according to the means of transport existing in the district crossed at the time of the concession.

In the concessions made by virtue of this law, the merchandise tariffs have been fixed by leagues (6.600 metres) and by arrobas (14 kilogrammes 688 grammes) as follows: $15 per ton and per kilometer or $ 8.20 U. S. gold for produce for export in general; $ 30 (or $ 16.30 U. S. gold) per ton and per kilometer for imported goods; for 1st, 2nd and 3rd class passengers respectively 600, 400 and 200 reis per league (6.600 meters) which is equal to $ 0,329; $ 0,219; and $ 0,109.

The present tariffs are generally lower than the limits given in 1852, and the Government, whose duty it is to approve them, always takes care to get them reduced each time.

(h) Guarantees an interest of five per cent on the capital employed, the term of the guarantee and the maximum capital remaining to be fixed.

In the concessions granted under that law, the guarantee is increased from five to seven per cent, because the provinces help with two per cent, and the State took on itself the responsibility of the provincial guarantee. The guaranteed capital is first of all estimated to a maximum figure, and after the construction of the railway is finished and the accounts of the bona-fide expenses made up, is settled.

The guarantee is paid in full when the takings of the line do not cover the working expenses, on the other hand the guarantee is limited to making up the seven per cent.

(i) Fixes the maximum dividends to be paid at eight per cent, after which the excess profits are divided with the State as a set-off or the responsibility assumed respecting the guarantee, and orders the fixing of a limit for the dividends on reaching which the tariffs shall be reduced. We have already show that from eight to twelve per cent half the excess returns to the State, and that twelve per per cent has been fixed as the limit on reaching which the tariffs shall be reduced, so that the profits can never exceed twelve per cent.

(j) The Company is forbidden to own or employ slaves. Now that there are no more slaves in Brazil, there is no necessity for this regulation, but its having been established in 1852 proves that for a long time back the Public Powers of Brazil were using all possible means to restrict the evils of slavery, a sad legacy of the times of colonists.

(k) Guarantees exenption from military and national guard service for those workmen and employe's of the railway who are natives of the country, and facilities and advantages as colonists for those who are foreigners.

Having already treated of this guarantee, it is scarcely remains for us to say that it has been fulfilled in all the concessions granted under that law.

(l) Exacts the approval of the Government to the statutes of the Company and does not recognise their legal existence before such approval.

The principle established is the following: every native or foreign Company formed to work a railway concession, must submit its statutes to the approval of the Government, who can exact that anything that is not in accordance with

the law and the concession be modified. Further, anything established in the statutes which may be contrary to the clauses and conditions of the contract of concession, and which may have passed unnoticed by the Government when approving them, will be, by right, considered null and void, and no modification made in the legal statutes will have legal force unless it be previously approved by the Government.

(m) Prohibits the Company from placing any obstacle in the way of free transit over the roads existing at time of the concession being granted, or that may have been established in the interests of the public alongside the the railway, nor to oppose the crossing of the railway by these roads nor to levy tax on such crossing.

When the track of a railway cuts an already existing public or private road, the Companies are obliged to provide, at their own cost, a passage either above or below the line. As regards the public roads that may be established after the construction of the railway, crossing is always permitted, but the cost of the works will not be chargeable to the Company. With respect to private roads that may be made after the construction of the railway, the consent of the latter is necessary in order to be able to cross it on the level, above, or below.

(n) Prescribes that in the contract the Government will fix terms for the commencement and conclusion of the works, and establishes a system of fines and forfeits in the event of delay.

That clause has been maintained in all the concessions. The line is divided into various lengths or sections, for each of which is fixed a term for the commencement of the works and another for their conclusion, with fines in the event of delay; should this happen, a further term is

granted, during which the fine runs, and when this has expired, if the Company is still in fault, forfeiture is declared.

(o) Reserves to the Government the right to redeem the concession, on the expiry of a term to be fixed in the concession.

In the concessions granted under this law, it has been agreed that, saving mutual agreement, that, saving mutual agreement, that right of redempcion cannot be exercised until thirty five years after the handing over of the line to traffic. In those conditions, the price to be paid for the redemption will be a capital in bonds of the Brazilian Public Debt, with an interest equal to the average profit given by the line during the last five years.

(p) Gives the Government the right to make and impose the neeessary regulations for the construction, maintenance and working. as also for the control, public order, and safety.

In compliance with that clause, the Government has published the regulations, has appointed a fiseal engineer on each line, and has in Europe an agent to arrange the guarantee accounts of the Companies. Questions of detail are arranged by special agreement.

Art. 2. Makes the dispositions of this law, applicable to the Companies that may be formed for the construetion of railways in other parts of the country, after ratification by Parliament of what refers to the convenience of the line granted, is usefulness and the responsibility of the State.

That article has considerably widened the reach of the law on which we are commenting, it has made it the starting point of the concessions of the first great lines, and has given a great help to the new industry of railways

besides establishing in Brazil a perfected system of railway communications.

As a consequence of that article of the law, three other great lines have been granted, all of 1 m. 60 guage, one in the Stato of San Paulo, another in the State of Bahia, and another in the State of Pernambuco.

Arts. 3 and 4. These articles are of no interest for this explanation. The third is a transitory measure and the fourth is simply the formula with which all laws concluded.

In working this chapter the following works have been consulted, viz:—the reports of the Ministery of Agriculture, Commerce and Public Works for the years 1883 to 1892; the Legislative Collection up to 1892: "Le Bresil" by E. Lavasseur (Extract from the Enciclopedia of 1889); "Le Bresil" by Alfred Marc of 1889: and Fernandez Pineiro's work (Le Bresil" of Sta. Ana Nery 1889) which latter has been entirely followed as regards the legal regime.

We will now give statements shwing: the States crossed by the railways, the names of the lines and of the concessionaires, the date of concession, the capital cost of the haes, the guaranteed capital, the percentage of interest enjoyed, the technical feautures of the lines, length open to traffic, in construction, surveyed and to be surveyed; the cost per kilometer of the line open to traffic, and the receipts expenses, and profit or loss per kilometer.

RAILWAY SYSTEM OF THE BRAZILIAN

STATE

STATES.	RAILWAYS.	CONCESSIONAIRES.	DATE OF CONCESSION.
Amazonas. . . .	Madeira to Mamoré. . . .	State.	25th. November 1882
Pará	Belém—Bragança	"	21st. March 1879
Ceará	Fortaleza to Baturite and Quixeramobim	"	25th. July 1870
"	Comocim—Sobral—Ipú. . .	"	19th. July 1878
Pernambuco . . .	Central Recife to Russinha Pesqueira	"	26th. October 1878
" . . .	Pernambuco Soutern—Palmares to San Francisco. . .	"	9th. May 1876
Alagôas	Paulo Affonso (from Piranhas to Yatobá)	"	19th. July 1878
Bahia	Alagoinhas to San Francisco.	"	26th. February 1876
Rio de Janeiro . .	Rio of Ouro	"	22nd February 1876
—	Sto. Amaro—Jaen	"	11th. July 1878
R. and Minas Geraes.	Central Brazilian	"	9th. May 1855
" " "	" " "	"	24th. May 1871
San Paulo. . . .	Araguará to Rio Grande. .	"	—
Rio Grande del Sud.	Porto Alegre to Uruguayana.	"	10th. September 1873
	Branch from Cacequy to Bagé.	"	" " "
	" " Saican to Santa Anna	"	" " "

Totals . . . . . .

LINES ENJOYING

Rio Grande del Norte	From Natal to Nova Cruz. .	Natal and Nova Cruz Railway Company Limited. . . .	2nd. July 1873
	" " " Villa of Ceará Mirim.	— —	—
Parahyba	Conde d'Eu.	The Conde d'Eu Railway Company Limited	5th. December 1873
Pernambuco . . .	Recife—Palmares.	The Recife and S. Francisco Railway Company Limited.	7th. August 1852
	Recife—Limoeiro—Timbauba	The Great Western of Brazil Railway Company Limited.	16th. July 1870
	Tamandaré to Barra . . .	Compagnia Brazileira de Estradas de Ferro é Navegaçao	20th. January 1890
	Ribeirão to Bonito . . .	— —	—
Alagôas	Maceió — Imperatriz (Central das Alagôas)	Alogôas Railway Company Limited	18th. October 1879
	Maceió to Leopoldina . . .	Compania Promotora de Melhoramentos de Alagôas. .	5th. November 1890
	Alagôas to Paulo Affonso. .	Compania Estrada de Ferro Central Alagôana. . . .	8th. November 1890

REPUBLIC ON 1st JANUARY 1892.

LINES.

CAPITAL. Cost of the lines open to traffic including rolling stock. (in dollars.)	GUARANTEE. Capital guaranteed.	GUARANTEE. Rate of interest.	TECHNICAL FEATURES. Gauge.	TECHNICAL FEATURES. Minimum radius.	TECHNICAL FEATURES. Maximum gradient p. 100.	LENGTH IN KILOMETERS. Open to traffic.	In construction	Surveyed.	To be surveyed	Total.
..	..	..	1m.00	160m.00	2.50	..	..	330.000	..	330.000
1.475.000	..	..	"	130m.00	2.00	59.090	..	150.000	..	209.090
5.049.000	..	..	"	120m.00	1.80	197.631	200.000	..	..	397.631
3.260.537	..	..	"	181m.00	1.80	216.590	..	..	..	216.590
2.808.000	..	..	"	159m.00	1.80	72.075	97.930	..	..	170.005
5.271.420	..	..	"	150m.00	1.80	146.420	..	500.000	..	646.420
2.781.000	..	..	"	82m.00	3.00	115.853	..	..	..	115.853
7.424.524	..	..	"	153m.00	1.80	321.906	131.690	..	..	453.596
741.248	..	..	"	65m.00	4.10	83.054	..	..	..	83.054
1.301.161	..	..	"	90m.00	2.00	26.020	..	..	..	26.020
54.767.458	..	..	1m.60	181m.00	1.80	724.918	..	..	..	724.918
63.903.185	..	..	1m.00	117m.00	2.00	393.853	150.000	..	..	543.853
..	..	..	"	190m.00	1.80	..	..	531.000	..	531.000
11.712.259	..	..	"	2 3m.00	1.80	377.000	254.784	..	..	631.784
..	..	..	"	120m.00	1.80	..	205.843	..	..	205.843
..	..	"	"	..	..	..	..	138.842	..	138.842
110.801.052	..	..	..	..	..	2.741.389	1.040.157	1.649.832	..	5.431.379

STATE GUARANTEE.

3.854.213	3.000.843	7	1m.60	110m.00	2.05	121.000	..	..	..	121.000
..	..	..	..	..	..	..	44.400	..	..	44.400
3.791.631	(3.276.000	(7	1m.00	105m.00	2.17	141.000	..	..	..	141.000
	(378.230	(6								
9.037.125	(5.824.001	(7	1m.60	400m.00	1.25	124.739	..	..	..	124.739
	(2.357.071	(5								
4.202.004	2.730.000	7	1m.00	120m.00	2.00	141.065	..	..	..	141.065
..	2.135.952	6	"	..	..	..	97.500	32.900	150.000	280.400
32.365	..	..	..	..	..	22.000	10.000	28.700	..	60.700
4.207.500	(2.485.938	(7	..	103m.00	2.00	150.000	..	..	..	150.000
	(1.074.528	(6								
..	2.751.840	6	..	..	..	..	..	167.693	..	167.693
..	8.199.090	6	..	..	..	..	..	191.195	305.891	500.000

STATES.	RAILWAYS.	CONCESSIONAIRES.	DATE OF CONCESSION.
Bahia	Bahia Alagoinhas	The Bahia and S. Francisco Railway Company Limited.	19th. December 1853
	Alagoinhas—Timbó	The Timbó Branch Railway Company Limited.	7th. April 1883
	Central de Bahia.	Brazilian Imperial Central Bahia Railway Company Limited	17th. January 1863
	Nazareth—Santo Antonio.	— —	February 1871
	Nazareth Tram-Road	Nazareth Tram-road Company	15th. December 1838
	Caravellas—Philadelphia	— —	23rd. April 1880
	Itapemerim—Alegre.	— —	15th. September 1883
Espiritu Santo	Victoria to Peçanha.	Companhia Estrada de Ferro Bahia é Minas.	12th. July 1890
	" " Santa Cruz de Rio Pardo.	Companhia E. de Ferro from Victoria to Sta. Cruz de Rio Pardo	15th. December 1888
	Sta. Edo. to Cachoeira de Itapemirim	Companhia Estrada de Ferro Leopoldina	" - "
Espiritu Santo and Minas Geraes.	From Benebente to Minas.	Companhia Geral de Estradas de Ferro do Brazil	" - "
Minas Geraes and Bahia	From Itabira to Jatobá.	Companhia Geral de Estradas de Ferro do Brazil	8th. November 1880
	Leopoldina.	— —	27th. March 1892
Minas Geraes	Minas and Rio	The Minas and Rio Railway Company Limited.	27rd. February 1875
	Peçanha to Araxá	Companhia Estrada de Ferro de Peçanha á Araxá.	28th. November 1890
	Western Minas	Companhia Estrada de Ferro Oeste de Minas.	30th. April 1873
Rio Janeiro	Muzambinho. From Tres Corações to the Rio Verde and branch to Campanha	Companhia Estrada de Ferro Muzambinho	11th. October 1890
	Juiz de Fora to Piau	Juiz de Fora á Piau	1st. September 1880
	Ottoni to Pittangui.	— —	13th. November 1881
	Santa Isabel ot Rio Preto	— —	26th. December 1873
	Rozende—Areas	— —	21st. February 1872
	Macahé—Central.	Companhia Industria Lavoura e Viação de Macahé.	15th. December 1888
	Rio Bonito to Cabo Frio	Companhia E. de F. de Rio Bonito á Cabo Frio	19th. October 1889
	Ribeirão to Bonito	Empresa da E. de F. de Ribeirão ao Bonito	—
	Mogyana	Companhia Mogyana de Estradas de Ferro	13th. November 1872
San Paulo.	Bragantina	— —	15th. September 1873
	Taubate to Ubatuba y Ramal á San Luis	Companhia E. de F. Norte de San Paulo	5th. January 1888
	Sorocabana.	Companhia Estrada de Ferro Soracabana	30th. June 1870
	Ytú to Iguape.	Companhia Viação Ferrea Sapucahy	26th. April 1890
	From Paranaguá to Curityba Lapa and Rio Negro.	Compagnie Generale des chemins de fer Bresiliens	20th. November 1872
Santa Catalina	Dna. Theresa Christina	— —	1st. June 1871
Rio Grande del Sud.	Rio Grande to Bagé.	The Southern Brazilian Rio Grande do Sul Company Limited	11th. August 1871
	Quarahim to Ytaqui	The Brazil Great Southern Railway Company Limited.	19th. November 1881

CAPITAL. Cost of the Line open to traffic including rolling stock. (In dollars.)	GUARANTEE.		TECHNICAL FEATURES.			LENGTH IN KILOMETERS.				
	Capital guaranteed.	Rate of interest.	Gauge.	Maximum radius.	Maximum gradient p. 100.	Open to traffic.	In construction	Surveyed.	To be surveyed.	Total.
8.697.582	8,786.000	7	1m.60	300m.00	1.25	123.340	..	..	..	123.340
1.446.900	1.446.900	6	1m.00	120m.00	1.60	83.000	..	..	..	83.000
7.704.182	7.098.000	7	"	"	3.33	315.000	..	300.000	..	615.000
677.844	396.503	7	"	..	..	34.000	..	138.000	..	172.000
947.700	947.700	6	"	..	..	42.000	23.000	..	..	65.000
6.507.300	3.795.544	7	"	107m.00	2.50	142.000	251 000	..	..	393.000
867.640	677.847	7	..	..	..	70.000	..	208.000	..	278.000
..	7.862.400	6	1m.00	100m.00	3.00	..	84.100	395.900	..	480.000
..	1.392.300	2	"	"	"	..	85.000	..	..	85.000
..	1.474.200	6	"	..	..	..	90.000	..	..	90.000
..	5.208.840	6	"	..	..	..	331.000	..	..	331.000
..	..	6	"	..	..	..	..	92.000	2.000.000	2.092.000
39.624.952	13.101.603	6 y 7	1m.10; 1.; 0.95; 0.66	..	..	1.470.855	66.500	..	..	1.537.355
8.460.406	8.462.406	7	..	80m.00	3.00	170.000	..	..	..	170.000
..	..	6	..	..	..	..	..	288.000	..	288.000
3.737.804	18.549.111	..	0m.76	..	..	377.000	140.000	532.000	328.000	1.377.000
..	1.370.187	6	"	..	..	..	143.100	..	..	143.100
976.096	976.096	7	..	80m.00	2.00	61.000	..	..	..	81.000
..	3.272.978	7	1m.00	100m.00	2.50	..	242.000	..	..	242.000
2.455.615	2.009.648	7	"	80m.00	"	74.260	..	..	..	74.260
1.196.911	650.772	7	"	100m.00	3.00	28.360	65.000	..	..	93.360
1.236.174	1.266.174	6	"	..	..	44.000	13.280	..	..	57.280
..	819.000	6	"	..	..	..	75.000	..	..	75.000
994.266	994.266	6	..	..	..	32.000	..	28.700	..	60.700
10.427.665	11.418.967	6	1m.00	83m.00	3.00	740.000	390.000	..	..	1.130.000
1.258.108	1.258.108	7	"	120m.00	2.75	52.000	..	..	..	52.000
..	2.722.356	6	"	..	..	..	166.214	..	..	166.214
8.782.984	(2.982.517 (12.722.346	7) .6)	"	80m.00	2.00	376.000	776.700	200.000	..	1.352.700
..	..	6	"	101m.00	2.25	..	..	366.920	..	366.920
12.414.240	6.274.654	7	"	75m.00	3.30	231.000	138.240	72.200	..	441.440
3.343.038	3.041.795	7	"	100m.00	2.00	116.620	..	..	..	116.620
8.195.114	7.377.798	7	"	120m.00	3.00	283.000	..	..	..	283.000
3.851 225	3.276.000	6	"	..	..	175.000	..	..	..	175.000

STATES.	RAILWAYS.	CONCESSIONAIRES.	DATE OF CONCESSION.
Rio Grande del Sud.	Porto Alegre to Nuevo Amburgo.	—	30th. July 1869
	De Ytaquí to San Angelo.	(The Brazil Great Southern) Railway Company Limited.	—
	Santa Maria to Cruz Alta.	Compagnie del Chemins de Fer Sud-Ouest Brésiliens	9th. November 1889
	Torres to Porto Alegre.	Companhia União Industrial dos Estados do Brazil	19th. July 1890
	San Gerónimo to the Herbal mountains and branch to the Bagé—Cacequy line.	Companhia E de F.y Minas de San Gerónimo	24th. July 1890
	Pelotas to the San Lorenzo Colonies.	Empreza Industrial é Constructora do Rio Grande do Sul.	15th. January 1889
Paraná and Rio Grande del Sud.	Ytararé to Cruz Alta	Companhia União Industrial dos Estados do Brazil	9th. November 1889
	Estreito and San Francisco to Chopin	Companhia Estreito y San Francisco á Chopin	16th. October 1890
Santa Catalina and R. Grande del Sud.	San Francisco to Blumenean.	Do. do. do. do.	" " "
	Estreito, Brusque and Blumenean	Do. do. do. do.	" " "
	Variante de Porto Bello	Do. do. do. do.	" " "
	Blumeneau for Lages	Do. do. do. do.	" " "
Goyaz	Cberaba to Coxim	Banco União de San Paulo	—
	Catalao to Palmas	—	—
Gayaz and Matto Grosso	Catalão to Matto Grosso	—	—
Sergipe.	Aracayú to Simão Diaz	Companhia Brazileira de Estradas de Ferro é Navegaçao	2nd. August 1890
	Branch from Capella.	Do. do. do. do.	" " "

Sumas.

LINES WITHOUT

Pernambuco	Recife to Caxangá	—	30th. Octobre 1863
	Recife—Olinda—Beberibe	—	22nd. July 1868
	Ribeirão—Bonito.	—	—
	Ytatibense	—	—
	Jaraguá—Bebedouro	—	—
Minas Geraes	Ouro Preto to Peçanha.	Companhia de Obras Públicas e Emprezas do Estado de Minas Geráes	6th. June 1891
Rio Janeiro	Campos—San Sebastião	—	14th. September 1869
	Macahé—Campos.	—	3rd. February 1870)
	Santo Antonio de Pádua	—	23rd. December 1876)
	San Fidelis	—	8th. June 1876
	Rio de Janeiro to Mage	—	4th. November 1882
	Corcobado	Corcobado Hotel and Railway Company.	7th. January 1882
Rio Janeiro	Santa Anna	—	28th. June 1879
	União Valenciana	—	27th. April 1866
	Rodeio—Vassouras	—	—

CAPITAL. Cost of the Railways in traffic including rolling stock. (In dollars.)	GUARANTEE.		TECHNICAL FEATURES.			LENGTH IN KILOMETERS.				
	Capital guaranteed.	*Rate of interest.*	*Gauge.*	*Maximum ratios.*	*Maximum gradient p. 100.*	*Open to traffic*	*In construction*	*Surveyed.*	*To be surveyed.*	*Total.*
1.119.417	982.800	7	1m.00	250m.00	2.00	43.000	..	..	..	43.000
..	5.844.384	6	"	..	..	..	356.800	..	..	356.800
..	2.627.352	6	"	101m.38	..	..	160.400	..	..	160.400
..	..	6	"	..	..	..	..	222.140	..	222.140
..	..	6	"	100m.10	4.00	..	..	189.000	..	189.000
..	2.318.389	6	"	..	..	..	141.552	..	..	141.552
..	..	6	"	101m.28	2.50	..	..	1.071.512	1.400.000	2.471.512
..	..	6	"	..	..	..	..	..	1.800.000	1.800.000
..	..	6	"	..	..	..	..	120.000	..	..
..	..	6	"	..	..	..	..	140.000	..	..
..	..	6	"	..	..	..	..	35.000	..	..
..	..	6	"	..	..	..	..	83.000	..	388.000
..	..	6	"	..	..	..	..	1.000.000	..	1.000.000
..	..	6	"	..	..	..	..	..	800.000	800.000
..	..	6	"	..	..	..	..	..	1.800.000	1.800.000
..	3.202.390	6	"	..	..	..	(115.279 (80.174	..	..	195.453
160.961.566	192.013.826	..	..	..	..	5.649.239	4.086.329	5.915.771	8.583.894	24224233

STATE GUARANTEE.

716.000	..	..	1m.10	60m.00	1.30	20.000	..	..	..	20.000
240.000	..	..	1m.40	120m.00	3.50	12.000	..	..	..	12.000
337.078	..	..	..	..	..	22.000	38.000	..	..	60.000
240.000	..	..	..	..	..	19.000	..	..	..	19 000
140.000	..	..	..	..	..	10.000	..	..	..	10.000
..	..	..	1m.00	..	..	..	..	60.000	288.000	348.000
325.366	..	..	0m.95	120m.00	1.50	18.000	..	..	..	18.000
	..	..	(1m.00	150m.00	"	96.500	..	..	..	96.500
6.593 706	..	..	("	101m.00	2 50	92.710	..	..	..	92.710
965.250	..	..	..	..	..	76.000	..	..	..	76.000
1.084.355	..	..	..	..	..	..	..	..	..	..
			1m.00	220m.00	1.50	88.000	..	..	..	88.000
330.888	..	..	"	121m.00	30.00	3.720	..	..	..	3.720
1.640.926	..	..	"	101m.00	"	60.700	..	..	..	60.700
868.725	..	..	1m.10	72m.00	3.50	63.350	..	..	..	63.350
67.567	..	..	0m.66	45m.00	"	6.000	..	..	..	6.000

STATES.	RAILWAYS.	CONCESSIONAIRES.	DATE OF CONCESSION.
	Comercio and Rio de las Flores.	— —	26th. June 1871
	Alcantara—Maricá	— —	—
	Ramal Bananalense. . . .	— —	31st May 1880
	Quisama	Provincial concession . . .	—
	Rio Bonito to Juturnahiba .	— —	—
	Tijuca	Companhia Estrada de Ferro da Tijuca	7th. November 1891
Rio Janeiro . . .	Cruzeiro to Santa Cruz . .	Companhia Estrada de Ferro Lavoura, Rio é San Paulo.	4th. July 1891
	Botafogo to Angra de Reis .	Companhia Viação Ferrea Zapucahy	14th. February 1891
	Principe of the Gran Pará .	The Rio de Janeiro and Northern Railway Company Limited	27th. April 1852
	Norte	Do. do. do.	—
	Comercio to San Francisco Xavier	Empresa de Melhoramentos no Brazil	—
	Santos to Jundiahy. . . .	San Paulo Railway Bompany Limited	26th. April 1856
	Ituana	Companhia Ituana	—
	Paulista	" Paulista. . . .	28th. November 1868
	Rio Claro to San Cárlos of the Pinhal	Rio Claro S. Paulo Railway Company Limited. . . .	4th. October 1880
San Paulo . . .	Rio Pardo.	— —	—
	Taubate Tremembé. . . .	— —	—
	Santos—San Vicente . . .	— —	—
	San Paulo—Ssnto Amaro. .	— —	—
	Paraty to Iguapé.	Engineer Silva Lara and Dr. Pedro de Barros	—
	Taubate to Amparo. . . .	Do. do. do. y Roberto Narmantoo	—
San Paulo, Minas, Gayaz y Matto Grosso . . .	Pental to Matto Grosso . .	Juan Carlos Leite Penteado and others	19th. September 1891
Paraná and Matto Grosso	Ponta Grossa to Corumbá .	Fco. da Silva and Christiano Coutinho.	17th. " "
—	Madeira to Guaparé. . . .	Companhia Ed. de Ferro de Madeira á Guaparé . . .	30th. May 1891
—	Recife to the Pacific, ao international line, already constructed in Argentine and Chilian territory; definitely surveyed in Uruguayan territory, surveyed for over 100 kilometers in Brazil and still to be surveyed in Rio Grande and in the States of San Paulo, Minas, Gerães, Bahia and Pernambuco	Mello Barreto, Murinelli, Mirandola y Castro . . .	17th. October 1891

Sumas. . . . . .

GENERAL

States lines. . . . . .
Lines enjoying state guarantee. . . . . .
Lines without state guarantee. . . . . .

Totals. . . . . .

CAPITAL. Cost of the lines open to traffic including rolling stock. (in dollars.)	GUARANTEE. Capital guaranteed.	GUARANTEE. Rate of interest.	TECHNICAL FEATURES. Gauge.	TECHNICAL FEATURES. Minimum radius.	TECHNICAL FEATURES. Maximum gradient p. 100.	LENGTH IN KILOMETERS. Open to traffic.	In construction.	Surveyed.	To be surveyed.	Total.
886.100	..	..	1m.00	72m.00	4.00	35.650	..	..	..	35.650
463.320	..	..	..	..	..	38.000	..	..	..	38.000
444.015	..	..	1m.00	80m.00	1.25	29.000	..	..	..	29.000
..	..	..	0m.95	..	..	35.000	..	..	..	35.000
..	..	..	1m.00	80m.00	2.50	8.500	26.000	..	..	34.500
..	..	..	..	..	..	13.014	18.314	..	..	31.328
..	..	..	..	..	..	..	..	..	220.000	220.000
..	..	..	..	..	..	..	50.000	143.340	..	193.340
3.571.428	..	..	1m.00	100m.00	2.50	91.700	..	..	..	91.700
..	..	..	"	..	..	45.340	75.000	..	..	120.340
..	..	..	..	..	..	..	..	..	160.000	160.000
13.255.631	..	..	(1m.60	603m.00	10.16	8.000)				
			(1m.60	241m.00	2.50	131.000)	..	..	..	139.000
..	..	..	..	..	..	283.000	..	..	..	283.000
..	..	..	1m.60	301m.00	2.00	242.000	..	..	..	242.000
2.694.987	..	..	1m.00	120m.00	"	261.617	..	..	..	264.617
424.710	..	..	..	..	..	38.090	..	..	..	36.000
115.830	..	..	..	..	..	9.000	..	..	..	9.000
115.830	..	..	..	..	..	"	..	..	..	9.000
231.660	..	..	..	..	..	20.000	..	..	..	20.000
..	..	..	..	..	..	..	..	..	450.000	450.000
..	..	..	..	..	..	..	..	..	200.000	200.000
..	..	..	..	..	..	..	..	..	1.800.000	1.800.000
..	..	..	..	..	..	..	..	..	1.400.000	1.400.000
..	..	..	..	..	..	..	..	..	400.000	400.000
..	..	..	..	..	..	..	..	..	500.000	500.000
..	..	..	..	..	..	..	..	..	2.600.000	2.600.000
34.133.372	..	..	..	..	..	1.886.801	207.314	203.340	8.018.000	10.315.455

RESUMEN

119.301.052	..	..	..	..	..	2.744.380	1.040.157	1.649.832	..	5.434.370
160.961.566	192.013.826	..	..	..	..	5.649.239	4.086.329	3.915.771	8.583.894	24.234.233
24.133.372	..	..	..	..	..	1.886.801	207.314	203.340	8.018.000	10.315.455
305.596.190	192.013.826	..	..	..	..	10280420	5.333.800	7.768.943	16601894	39984057

RAILWAYS WORKING IN 1892.

RAILWAYS.	WORKING IN 1892. Gauge.	Length.	Cost per kilometer of line open to traffic.	FINANCIAL RESULTS. Receipts per kilometer.	Expenses per kilometer.	PROFIT. Per kilometer.	PROFIT. % of the cost of the line open to traffic.	Loss per kilometer.
State.								
Baturité	1m.00	197km6	25,500	1234.	1.351.5	—	—	117.7
Comocim—Sobral—Ypú.	"	216 " 6	15.054	165.5	352.2	—	—	186.9
Central Pernambuco	"	72 " 1	39,000	2.175.1	832.1	1.343.0	3.70	—
Palmares to San Fco.	"	146 " 4	35,860	857.8	2.155.6	—	—	1297.8
Paulo Affonso.	"	115 " 9	24.000	344 8	666.6	—	—	321.8
Alagoinhas to San Fco.	"	322 " 0	16,368	523.3	1.241.6	—	—	718.3
Rio of Oro.	"	83 " 0	8,963	1,551.0	2.327.2	—	—	776.2
San Amaro-Jacú.	"	36 " 0	36,154	—	—	—	—	—
Central Brazilian	1m.60	725 " 0	75,541	7.897.8	5.875.3	2.022.5	3.04	—
"	1m.60	394 " 0	33,287					
P.Alegre to Uruguayana	"	377 " 0	31,037	1.220.0	1.115.6	—	—	195 6
Guaranteed by the State								
Natal to Nova-Cruz.	1m.00	121 " 0	31,853	438.5	351.7	86.8	0.27	—
Conde d'Eu.	"	141 " 0	24,891	706.8	895.6	—	—	188.8
Recife–Palmares	1m.60	124 " 7	72,297	5.665.4	3.862.8	1.802 6	2.49	—
Recife—Limoeiro—Timbauba.	1m.60	141 " 1	30,141	3.585.6	2.965.8	619.8	2.03	—
Riberão to Bonito	—	22 " 0	—	—	—	—	—	—
Maceio—Imperatriz	—	750 " 0	28 050	1,019.1	834.5	184 6	0.63	—
Bahia—Alagoinhas	1m.60	124 " 3	70 340	2,498.2	2.382.1	26.1	0.03	—
Alagoinhas—Timbó	1m.00	83 " 0	17,118	488.1	942.1	—	—	431.0
Central Bahia.	"	315 " 0	24,614	1,198.3	987.9	210.4	0.85	—
Nazareth Santo Antonio	"	34 " 0	19,937	—	—	—	—	—
Nazareth Tram-road	"	42 " 0	14,580	—	—	—	—	—
Caravellas Philadelphia (1887)	"	142 " 0	20,000	886.0	554.0	312.0	1.56	—
Itapemirim Alegre	"	70 " 0	12,395	—	—	—	—	—
Leopoldina.	—	1471 " 0	26,938	1.447.0	920.0	527.	2.00	—
Minas and Rio	1m.00	170 " 0	49 767	3.508.3	2 641.0	867.3	1.71	—
Western Minas	0m.76	377 " 0	9,452	1.150.6	716.4	433.2	4.09	—
Juiz de Fora to Pian	—	61 " 0	16,001	—	—	—	—	—
S. Isabel of the Rio Preto	1m.00	74 " 5	55 050	—	—	—	—	—
Rosendo-Areas	"	28 " 4	12,870	—	—	—	—	—
Central Sergipé	"	44 " 0	16,389	—	—	—	—	—
Ribeirão to Bonito	"	32 " 0	—	—	—	—	—	—
Mogyana (main line 1887)	"	740 " 0	—	3.080.7	1.638.8	1.441.9	14.90	—
Bragantina	"	52 " 0	24.191	—	—	—	—	—
Sorocabana	"	376 " 0	23.359	1.943.	676.	1.267	3.00	—
Paranaguá—Curityba—Lapa	"	231 " 0	(91,000 (24,222	4.847.2	2,724.8	2.200.4	—	—
Theresa-Christina	"	116 " 0	30.386	894.3	1.224.1	—	—	329.8
Rio Grande to Bagé	"	283 " 0	28,938	1.319.5	1.378.5	—	—	59.0
Quarahim to Itaqui	"	175 " 0	22 007	358.5	520.3	—	—	161.8
Un guaranteed.								
Recife—Caxangá	1m.10	20 " 0	—	—	—	—	—	—
Macahe—Campos.	1m.00	96 " 0	52,945	3.134.5	1.841.5	1.593.0	3.10	—
Santo Antonio of Padua.	"	92 " 7						
Rio Janeiro to Magé	"	88 " 0	15,141	—	—	—	—	—
Principe of the G. Pará	"	91 " 7	—	3,005.8	3,107.1	1.898.7	5.10	—
Santos to Jundiahy	—	139 " 0	95,364	24 179.0	18.616.7	5.533.1	5.80	—
Ituana (1886)	1m.00	283 " 0	25,209	1,295.0	870.0	397.	1.18	—
Paulista	1m.60	242 " 0	36,737	7,244.0	3.325.0	3.918.0	13.04	—
Rio Claro	1m.00	264 " 6	9,857	1,548.2	826.0	722 3.	7.32	—

The Chilian Republic.

CHAPTER IV.

THE RAILWAYS OF CHILE.

The statistical synopsis of Chile for the year 1891 which we will give will show the railways which up to that time had been opened to public service, as also those in construction.

The State railways are divided into three sections, whose lengths are as follows:

	KLMS.
1st. From Valparaiso north to the bank of the Mapocho, including the branches from Las Vegas to the Andes and from Boron to the Port	228
2nd. From the Mapocho to the Talca station, including the branches from Tuugay to Mercado and from Tinguiririca to Palmilla	296
3rd. From Talca to Victoria, including the Los Angeles, Traiguen, and Talcahuano branches	582
Total	1106

The cost of the sections as delivered over by the contractors is show in the following statement:

SECTION.	LENGTH.	COST.	Average price per kilometer.
	Kms.	$ *gold.*	$ *gold.*
Valparaiso to Quillota.	55	4 694.900	85.361
Quillota to Santiago	129	6.991.969	54.201
Las Vegas to San Felipe.	30	459.076	15.302
San Felipe to Los Andes.	15	453.958	30.263
Santiago to San Fernando	134	5.000 000	37.313
San Fernando to Curicó	51	1.378.460	27.028
Palmilla Branch.	43	422 285	9.820
Curicó to Talca.	65	1.869.061	28 754
Talca, Chillán and San Rosendo to Angol	239	6.708.944	28.070
Chillán to Talcahuano	186	4.917.256	26.436

The following statement shows the cost of the railways in the years 1889 and 1890:

	1890.	*1891.*
Permanent way	$ 41.998.492.89	$ 44.410.633.76
Traffic equipment	" 8.299.076.19	" 10 108 117.47
Shops.	" 424.561.68	" 443.015.49
Stores and duplicate parts	" 1.175.806 60	" 1.211.892.55
Furniture and tools	" 228.891.75	" 279.852.16
Total cost of the Railways.	$ 52.126.829.11	$ 56.453.511.23
Cash on hand	" 181.683.69	" 715.526.84
Outstanding accounts and sundry debtors.	" 1.569.963.29	" 1.658.310.40
Total.	$ 53.878 476 07	$ 58.827.348.47
The gross receipts were.	$ 8.060.830.14	$ 8.482.305.57
and working expenses	" 6.911.940.04	" 6.953.690.17
giving a net profit of.	$ 1.148.890.10	$ 1 528.615.40

In 1889 the working expenses were 85.74 % of the receipts and in 1890, 81.98 %; in the former year the profit was 2.13 % of the capital cost of the railways and in the latter 2.70 %.

The receipts were as follows :

		1889.		*1890.*
Passengers	$	2.671.618.40	$	2.791.784.80
Goods	"	4.560.801.32	"	4.527.189.47
Parcels and luggage	"	327.363.80	"	327.529.87
Storeage	"	45.167.10	"	45.020.76
Government passages & freights	"	423.216.00	"	692.995.82
Season tickets	"	46.849.50	"	56.687.80
Mole dues	"	6.00	"	12.00
Loading and unloading wagons	"	26.201.92	"	23.755.12
Special trains	"	18.600.10	"	16.839.93
Ticket and parcels books	"	420.00	"	490.00
	$	8.060.830.14	$	8.482.305.57

The working expenses were:

		1889.		*1890.*
Administration	$	405.674.53	$	535.335.12
Traction	"	2.468.061.17	"	2.567.629.29
Coaches	"	320.660.74	"	363.997.50
Goods	"	1.191.976.38	"	1.302.321.07
Stores	"	142.717.38	"	159.718.72
Stations	"	450.468.04	"	564.265.03
Maintenance of permanent way and buildings	"	1.932.381.80	"	1.520.423.44
Total	$	6.911.940.04	$	6.953.690.17

The receipts contributed by each section were:

1st. Section	$	2.457.107.33	$	2.635.652.07
2nd. do.	"	3.587.222.20	"	3.733.398.25
3rd. do.	"	2.016.500.61	"	2.113.355.25
Total	$	8.060.830.14	$	8 482.305.57

The following is the proportion in which the passengers, goods etc: have contributed to the total receipts:

	1889.	*1890.*
Passengers	33.14 %	32.91 %
Goods	55.84 "	53.37 "
Luggage	4.06 "	3.86 "
Government passages. .	5.26 "	8.17 "
Sundries	1.70 "	1.69 "
	100. %	100. %

The number of passengers carried was:

	1889.	*1890.*
1st. Section.	1.408.896	1.480.637
2nd. do.	1.708.706	1.142.126
3rd. do.	871.365	959.075
	3.988.877	3.581.388

The cargo handled was:

	1889.	*1890.*
	Metric quintals.	Metric quintals.
1.st Section.	6.494.331	6.690.530
2.nd "	4.875.921	5.260.962
3.rd "	4.509.446	4.720.753
Total. . . .	15.879.698	16.672.245

The traffic in coal, wood and wheat represents about a

third of the number of metric quintals transported in 1890, viz:

Coal	2.317.131	met. quintals
Wood.	1.306.071	" "
Wheat	1.538.632	" "
	5.161.834	met. quintals

The receits per kilometer for passengers and cargo in the years 1889 and 1890 were as follows:

Per train kilometer . . .	$ 1.136	$ 1.295
" vehicle " . . .	" 0.125	" 0.118
" ton " . . .	" 0.0191	" 0.0198
" passenger per kilometer.	" 0.0211	" 0.0213
The coal consumed in the same years was. . . .	tons. 113.521	tons. 125.177
tc the value of	$ 1.442.087	$ 1.561.615
The average number of kilograms of coal consumed per hundred kilometers rum was	" 1.663	" 1.643

The following is the number of engines, carriages and wagons in service in the years 1888 and 1890:

	1889	*1890*	
Engines.	129	153	
Carriages	192	202	
Luggage wagons. . .	43	2.862	
Goods do. . . .	2.339		

The number of kilometers run by the engines, carriages and wagons in service, was:

	1888.	*1890.*
Engines	6.432.356	7.161.601
Carriages	11.252.301	12.208.006
Wagons	52.397.108	59.669.209

The number of service telegrams sent over the railway telegraph lines was	813.376	1.022.642
Number of words in same . .	16.175.200	20.925.342
Private telegrams.	2.780	2.604
Costing	$ 985 32	$ 901.68
N.° of telegraph offices . . .	119	131
" " telephone do. . . .	60	75

The railway from Chañaral to the Animas and Salado mines, 65 1/4 kilometers in length, was bought by the Government for the high sum of $ 350.504.23 and was handed over to traffic on the 21st January 1889.

The maintenance of this line is a heavy drain on the State. In the first eleven months of 1890 the expenses were $ 82.367.70, and the receipts only $ 55.686.88 giving a loss of $ 26.680.82.

It has been found that it is not a line which can be worked by the State, because in such a small undertaking it is only private enterprise that can introduce economies. The line has been placed in first-rate condition and well equipped, at a cost of over $ 100.000.

The President of the Republic has been authorized to spend up to $ 1.500.000 in acquiring, by means of public tender, 350 store wagons, 200 cattle-wagons, 100 four-wheeled box-wagons, and 72 pairs of wheels for passenger carriages, for the use of the railways now working.

For the present year the administrative estimate of the State Railways amounts to $8.826:176.

The private railways are the following, commencing with the North:

	KLMS.
From the port of Arica to the city of Tacna. . .	63
" the port of Pisagua to Tres Marías, 90 klms, and branches to Agua Santa and Puntunchara and sidings, together	106
" the port of Iquique to Tres Marías, 109 klms, to Virginia 31 klms, branches to stores and sidings, total.	194
" the port of Patillos to Salitreras del Sur . .	93
" " " " Mejillones del Sur to the Cerro Gordo mine	29
" the port of Antofogasta, vía Salinas de Dorado, to tho town of Calama and thence towards the East in the direction of the borax deposits of Ascotan on the borders of Bolivia, into the interior of which country the line should continue for a few kilometres to the rich silver mine at Huanchaca	440
" the port of Taltal to Cachiyuyal or to Refresco.	82
" the port of Caldera to Copiapó, branching out from thence to the Puquios mines, San Antonio de Apacheta, and to Chañarcillo or to Juan Godoy	242
" the port of Carrizal Bajo to Carrizal Alto, vía Barranquilla and Canto del Agua, 36 kilms, and from thence another 45 khns eastwards, to the Cerro Blanco mine	81

	KLMS.
From the port of Coquimbo to the city of la Serena y la Compañía.	15
" the same port to the city of Ovalle with a branch to Panulcillo	123
" the port of Serena to Elqui or to the town of Rivadavia, to the east of the city of Vicuña .	78
" the port of Tongo to the Tamaya mine . .	55
" the port of Laraguete, in the bay of Arauco to the coal mines of Quilachauquin and Maqnegua	40
" the city of Santiago to Pirque	21
Total	1662 KLMS.

There are also some other short railways which serve the coal-mines of Coronel, Lota, Lebu, etc: and a tram or railway, worked by animal power, 6 to 8 kilometers long, between the port of San Antonio and Boca de Maipo.

In the cities of Santiago and Valparaiso thore are convenient tramways, of over 60 kilometers long in the first-named and a little over 10 in the second.

The same service has been established in the cities of Concepcion, Copiapó, Chillán, Rengo, Quillota, San Felipe, Santa Rosa, Serena, Talca etc:

The number of passengers carried last year by the Valparaíso urban railway was:

1st. class	18.215.040
2nd. "	14.171.913
Total	32.386.953

Besides these means of communicatión, Chile possesses over 800 public roads, whose total length is upwards of 66.000 kilometers; 2000 local roads and paths maintained

by municipalities or private persons, with a total length of over 40.000 kilometers, and 78 navigable water-courses of over 4.600 kilometers in length.

For the maintenance and extension of the public roads and the opening of others, the sum of $ 800.000 was voted from the Nrtional funds for the year 1890, and $ 550.000 for the current year. The inspection and carrying out of these works, and of bridges, buildings etc;, is under the care of a Public Works Office to which is attached the necessary staff of civil engineers.

Railways in construction. The following statement will give the name and length of the lines being constructed, the engineers in charge, and the gauge of each:

NAME OF LINE.	Length in kilometers.	Gauge.	ENGINEER IN CHARGE OF THE WORKS.
		M.	
From Huasco to Vallenar. . .	49.1	1.00	Boleslao Kulczewsky.
" Vilos to Illafel y Salamanca.	120.0	1.00	Eduardo Barriga.
" Calera to Ligua. . . .	71.5	1.00	Santiago Montt V.
" Santiago Melipilla. . .	59.0	1.68	Federico Garcés P.
" Pelequén to Peumo. . .	28.1	1.68	Pedro A. Rosselot.
" Palmilla to Alcones . .	44.0	1 68	" " "
" Talca to Constitucion. .	84.6	1.00	Santiago Sotomayor.
" Parral to Cauquenes. .	49.4	1.68	Isaac Montt.
" Coihue to Mulchén. . .	41.4	1.68	Carlos Herman M.
" Victoria to Toltén. . .	106.0	1 68	Luis R. de la Mahotière.
" Valdivia to Pichi-Rapulli	95.0	1.68	Ricardo Martinez V.
" Pichi-Ropulli to Osorno.	70.0	1.68	José Antonio Vadillo.

Of the line from Santiago to Melipilla the section between the former city and Chiñihue, 48 kilometers long, is open to traffic, as is also the part as far as the river Cachapoal, 18 kilometers long, of the Pelequén—Peumo line.

The following statement will show the total amount of earth which, according to the surveys, it will be necessary to move, the amount moved up to the dates indicated, and the length of rails laid during the last year.

NAME OF LINE.	MOVEMENT OF EARTH EFFECTED UP TO THE DATES INDICATED OF THE YEAR 1891.			TOTAL MOVEMENT OF EARTH, ACCORDING TO THE SURVEYS.		LENGTH OF RAILS LAID UP TO 1891.
	Cuttings.	Banks.	Dates.	Cuttings	Banks.	
	Cubic meters.	Cubic meters.		Cubic meters.	Cubic meters.	Meters.
From Huasco to Vallenar.	83.405	81.287	January .	234.000.00	164.000.00	
" Ovalle to San Márcos	204 852	173.882	"			
" Vilos to Illapel & Salamanca . . .	336.567	383.932	"	31.486.75		
" Calera to Ligua. .	488.760	544.537	February .	861.375.00	800.000.00	
" Santiago to Melipilla	1.000	400	"	186.157.00	206.210.86	
" Pelequén to Peumo.	30.562	102.446	March. . .	49.270.32	143 342.28	31.000
" Palmilla to Alcones.	30.526	44.530	"	213.244 20	288.681.78	
" Talca to Constitución	395.419	693.847	December .	760.366.89	871.214.06	12.000
" Coihue to Mulchén .	3.725	22.491	"	308.414.57	497.282.81	
" Victoria to Toltén .	555.535	485.065	"			11.000
" Toltén to Antilhue.	74.830	75.348	February .			
" Vaidivia to Pichi—Ropulli	35.011.978	20.173.706	"	3.364.396.12	5.340.865.21	
" Pichi — Ropulli to Osorno			"			
" Parral to Cauquenes	85.918	140.992	December .	81 808.90	348.380.72	1.600

These constructions were but slightly advanced in the year 1891. Under the dictatorship the men employed on them were taken as recruits, and the works, which were occasioning a heavy disbursement, had shortly after to be suspended, as the maintenance of the numerous army did not allow of other expenses being incurred.

The dates on which the works were commenced on the various lines and those on which the State should take them over: the approximate cost of each including rolling stock and buildings, and the average cost of construction per kilometer, are shown in the following table:

NAME OF LINE.	DATE OF HANDING OVER THE STAKED ONT ROUTE.	DATE OF HANDING OVER THE LINE.	TOTAL APPROXIMATE COST OF THE LINE, INCLUDING ROLLING STOCK AND BUILDINGS.		AVERAGE COST PER KILOMETER OF LINE OPEN TO TRAFFIC.
			Contract price in gold dollars.	Amount of the estimate in national currency.	
			$	$ Cts.	$ Cts.
From Huasco to Vallenar . . .	11th. May 1889.	11th. May 1891.	425 000	565.700 00	8.655 80
" Ovalle to San Márcos. . .	31st. May 1889.	31st. May 1892.	800.000	1.276.800 00	12.698 33
" Vilos to Illapel y Salamanca .	20th. April 1889	20th April 1892	1.260 000	1.801.040 43	9.843 75
" Calera to Ligua and Cabildo.	28th. January 1889	20th. January 1892	1.650 000	2.670,000 00	23.076 00
" Santiago to Melípilla. . .	12th. January 1889	12th. January 1891	1.050.009	1.673.229 49	17 796 61
" Pelequén to Peumo . . .	" " "	" " "	550.000	689.468 39	19 576 00
" Palmilla to Alcones . . .	" " "	" " "	600.000	717.111 01	13.636 30
" Talca to Constitución . .	29th. March 1889.	29th. January 1892	1.425.000	1.903.376 32	16.843 90
" Coihue to Mulchén . . .	30th. March 1889.	30th. March 1892.	625.000	1.650.873 53	15.096 61
" Victoria to kil. 130 . . .	15th. April 1889	15th. April 1894			
" Kil. 130 to Antilhué (kil. 235)	" " "	" " "			
" Valdivia to Pichirropulli (kil.305)	" " "	" " "	932.500	14.775.709 76	24.095 60
" Pichirropulli to Union and Osorno (kilms. 372) . . .	" " "	" " "			
" Parral to Cauquenes. . .	31st. January 1890	31st. March 1891.	—	618.909 11	4.634 50

Don Fidel S. Merino is contractor for the line from Parral to Cauquenes and Don Tomas R. Albarracin for that from Victoria to Toltén: the remainder are being constructed by the State. On the termination of the construction of all, the accounts will be examined by the North and South A. C. C.ºs.

The bridges to be erected in these lines and their length, as well as the number and length of their spans, are as follows:

NAME OF LINE.	NAME OF BRIDGE.	Nº. OF SPANS AND THEIR LENGTH.	TOTAL APPROXIMATE LENGTHS.
Ovalle to San Marcos	River Humalata	3 of 50. mts.	150. mts.
	do. do.	2 " 50. "	100. "
	do. Limaré	5 " 50. "	250. "
	Quebrada Seca	1 " 40. "	40. "
Vilos to Illapel and Salamanca	Lake of Conchalé	2 " 25. "	50. "
	River Choapa	2 " 35. "	70. "
	do. Illapel	1 " 25. "	25. "
Calera to Ligua and Cabildo.	do. Aconcagüa	5 " 40. "	400. "
		4 " 50. "	
	Lake Litre	1 " 30. "	30. "
	do. Blanquillo	1 " 20. "	20. "
	do. Quebradilla	1 " 30. "	30. "
	do. Patagua	2 " 20. "	70. "
		1 " 30. "	
Santiago to Melipilla	do. Paico	1 " 25. "	25. "
	River Mapocho	5 " 50. "	250. "
Pelenquén to Peumo	do. Cachapoal	8 " 50. "	400. "
	Lake of Malloa	2 " 25. "	50. "
	do. of Limahue	1 " 41.66 "	41 66 "
Palmilla to Alcones	do. of Chimbarongo	2 " 40. "	80. "
	do. of Ligüeimo	1 " 60. "	60. "
Talca to Constitución	River Claro	5 " 40. "	200. "
	Lake of the Puercos	3 " 20. "	60. "
	Quebrada Honda	2 " 40. "	80. "
	River Maule	5 " 80. "	400 "
From Victoria to Valdivia and Osorno	Lake of the Chanco	1 " 30. "	30. "
	River Quino	3 " 60. "	180. "
	Lake of the Salto	5 " 40 "	200. "
	do. Quillén	3 " 70. "	210. "
	do. Cuyuuquén	3 " 20. "	60. "
	do. Lleguin	1 " 25. "	25. "
	River Cautin	1 " 60. "	60. "
	do. Quepe	1 " 65. "	65. "

NAME OF LINE.	NAME OF BRIDGE.	Nº. OF SPANS AND THEIR LENGTH.	TOTAL APPROXIMATE LENGTHS.
From Victoria to Valdivia and Osorno.	River Huichave	1 of 50. mts.	50. mts.
	do. Tementuco . . .	1 " 40. "	40. "
	do. Tollén	3 " 50 "	150. "
	First Llihuén. . . .	1 " 30. "	30. "
	Second do.	1 " 20. "	20. "
	Third do.	1 " 20 "	20. "
	Quillén	1 " 40. "	40 "
	River Cruces	1 " 55. "	55. "
	Ruca Pichú	3 " 20. "	60. "
	Iñaque	1 " 40. "	40. "
	Mafil	1 " 20. "	20. "
	Mulpún	1 " 20. "	20. "
	Calle-Calle	1 " 90. "	90. "
	Cucuilelpu.	1 " 20. "	20. "
	Collilelpu	1 " 55. "	55. "
	Chumpeco	2 " 60. "	120. "
	Llollelhue	1 " 20. "	20. "
	River Bueno.	2 " 55. "	110. "
	Pilmaiquén	2 " 55. "	110. "
	Cuinco	4 " 50. "	200. "

The Republic of Paraguay.

CHAPTER V.

THE RAILWAYS OF PARAGUAY.

Amongst the South American Republics Paraguay has not been backward in the commencement of the construction of railways. Her Governors have understood that although provided with exuberant natural riches and with a climate suitable for all the productions of the tropical zone, the various natural products could not be transported and be of commercial value without the facilities of communication between the interior of the country and the great fluvial arteries of the rivers Paraná and Paraguay that bound the Republic on the East West and South, and which afford an outlet to the markets of the River Plate. Under the Presidency of Don Carlos Antonio Lopez the construction was authorized of the line that leaving Asuncion should have terminated in Villa Rica.

The works were commenced in June 1859, and Dr. Bourgade, in his work entitled "Le Paraguay" writes as follows respecting them.

The first section was constructed under the direction of Engineer Padison and reached to the Paraguari, a distance of 72 kilometers from Asuncion. The surveys of the second section were made by Messrs. Valpy and Burrel and the works were about to be commenced when the war broke out that temporarily ruined the Republic. Until

1886 the works were entirely suspended when the Government annulled the concession that belonged to a private firm and ordered the continuation of the works.

This was entrusted to Don Luis Patri one of the richest capitalists in Paraguay, and from that moment the works were pushed on with great activity under the direction of the French engineer M. Gil Regnault, and the section as far as the station General Caballero, situated on the other side of Ibitury has already been opened to public traffic. The important surveys of M. Regnault have demonstrated in various points the mistakes made in the original plan by Valpy, and due to his experienced direction and to the beneficial resolution of Señor Patri it will not be long before Paraguay is provided with a railway in first class order.

The Government in desiring to foment by all possible means the prosperity of the industries and of private enterprise has resolved to sell this line and an English Company with sufficient capital has recently taken it over on condition of prolonging it to Villa Encarnación situated on the banks of the Paraná on the Southern boundary of the Republic. The line should be completed by 1894 and will establish communication with the Argentine Railway in course of construction between Monte Caseros and Posadas. The line this extended will place Paraguay in communication with the Argentine provinces of Corrientes and Entre Ríos as also with port of Montevideo via Concordia, Salto and Durazno.

Had it not been for the general crisis that has affected the whole of the River Plate and Brazil and which also compelled the Company to suspend the construction works at 100 kilometers from Villa Rica or 252 kilometers from Asunción on the right bank of the River Pirapó, the line

would actually have been completed as for as Villa Encarnación in 1892. There still remains to be constructed, in order that the line may reach Encarnación, a distance of 135 kilometers which will give the railway a total length of 387 kilometers.

With the general technical conditions of the whole line we are not acquainted, but in his work "The Republic of Paraguay" the author Alfredo M. du Graty writes as follows on the first section from Asuncion to Paraguay.

"From the Capital to the river Ingueri the railway runs up a hilly district in Luque a distance of 16 kilometers, with an elevation of 48 meters above the river level. From Ingueri to Paraguay the line runs in a valley of ten or twelve kilometers wide formed by the Altos mountains.

Throughout the section the heavy grades on the line are less than 1 % rise, the heaviest of all being 1 in 75; from Inguery to Paraguay there is only a difference in level of 45 meters.

It would have been possible to reduce even these gradients on the sections of the line but to do this the rails would have had to be laid in lowlying marshy lands, which would have considerably increased the works without producing any notable advantages in return.

The smallest curves on the line are of about 800 meters radius although there is one with a radius of 600 meters.

The embankments and cuttings are more or less equally distributed and may be calculated at 7000 cubic meters per kilometer.

The ground is of light earthy formation, easy to work and to avoid the deterioration caused by the rains on earth works of this nature, these are protected by being sodded.

The line crosses a large number of bridges it having been necessary to form sufficient watercourses to drain off the rain water which would otherwise have destroyed the earth works Indeed the number of these canals would appear altogether excessive if the nature of the rainfall in tropical climates were not taken into consideration; — such works being the most costly of all in the construction of a railway. The greater part of the bridges are of the wood which is found in Paraguay in great quantities and of special excellency for this class of work, in which they have used Lapacho, Urundel and Curupai woods, noted for their solidity and durability. (1)

The bridges over the canals are built on piles well driven into the earth or on buttresses of stonework; they are from 3.60 meters to 4 meters long and from 3 to 4 $^{1}/_{2}$ meters high.

The bridge over the Iribai has a total length of 54 meters, comprising a span of 12 meters over the river itself at a height of 8 meters: the one over the Itai in the Campo Grande is 36 meters; and the one to be built over the Ingueri will be 72 meters long. These bridges are very solidly built and are important works of art.

The rail used is of the American type laid on Quebracho sleepers, a wood of extra durability and proof aganist the effects of damp. (2)

The Government by the law promulgated on September 22.nd 1887 were authorized to sell the National Railway from Asuncion to Villa Rica with the obligation of its

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(1) It is a well established fact that the solidity and resistance of wood is in relation to its weight: Lapacho weight 80 kilograms to the cubic fort.

(2) Quebracho weighs 38 kilos to the cubic foot.

extension to Villa Encarnacion. The contract by which it was handed over to an English company styled "The Central Paraguay Railway Company" was made in May 1889, the price agreed upon being $ 2.100.000 gold, payable in gold one half in cash and the remainder in special preference shares bearing 6 % interest.

The Company should finish the whole line within five years time unless "force majeure" can be proved to have hindered same.

The guage of the section from Villa Rica to Encarnacion will be decided upon by the Government in accord with the Company; the latter haring the right to construct branches off the main line, without guarantee, the plans being previously approved by the Goverment. The State guaranteed 6 % interest for 20 years on the line from Asuncion to Villa Encarnacion in the following manner: From Asuncion to Villa Rica on the sale price of $ 2.100.000 gold; and from Villa Rica to Encarnacion on the kilometric cost of $ 30.000 gold; the line as constructed to be delivered to traffic in sections of 50 kilometers, and the guarantee service to be made six-monthly.

For the guarantee purposes the working expenses were fixed at 65 % of the gross receipts, the Company being under the obligation to deliver to the State monthly the net profits of the line until the whole of the guarantee payments may have been refunded; when the net profit of the line exceeds 6 %, the amount over and above will be destined to a reserve fund to attend to unavoidable losses etc, in the formation and inversion of which the Government will intervene; when the sums carried to such reserve fund have reached $ 500000 gold, the amounts will be paid to the State until the guarantee account may be liquidated and balanced.

During the time that the guarantee is in force the Government in accord with the Company will fix the tariffs, and when the profits of the line exceed 12 % the Government will fix same.

The property, material, and tools for the construction maintenance and working of the line shall be free of all fiscal duties; The Company undertakes to carry the public correspondence free and to charge half the ordinary tariff rates for the transport of employees, troops, ammunition, armament, equipment etc. for the national forces, as also for the carriage of the colonists and their luggage when sent by the Immigration Office. Perpetual free concession was made of the state lands necessary for the construction of the line, stations, workshops, sheds and other works, in accordance with the approved plans; for the formation of new towns each station shall cover a space of 1000 meters square, the expropriation of such lands being made for the account of the Company and not including houses or villages. The right of cutting the necessary woods for the construction of the line from the state lands, was given, as also to work any quarries for the same purpose; and the private lands were declared of public necessity when required for the installation of the line, the expropriation of same being for the account of the Company.

The Company undertook to construct a double line of telegraph from Asuncion to Villa Encarnacion which shall serve for the business of the Company although the administration of the line shall be under the State whose employees shall also be paid by it. The Government reserve the right to inspect all the works by its Engineers and to approve of any such in the construction of which they have not intervened. The Company must have its headquarters in the Capital of the Republic, and in case the Board of

Directors is established abroad, they must appoint in the Country a Representative with full powers to treat definitely and directly all the questions that may arise with the Government or private individuals, the books of the railway being kept in the national language. During the construction of the works the employees and workmen shall be exempt from military service; the questions that may arise between the Government and the Company shall be resolved by means of arbitration.

These were the general bases of the agreement made with the Central Paraguay Railway Co. for the prolongation of the line to Villa Encarnación.

With the object of avoiding any doubts as to any of the dispositions of the law of Setember 22nd. 1887 under which the contract we have just been reciting was concluded, the Congress passed the law, promulgated on July 31st. 1890, by which the clauses relating to the guarantee must be interpreted in accordance with the estipulations of same:

(*a*) The guarantee granted by the State will be paid intact:—

(*b*) In each contract will be fixed a certain percentage as working expenses which the Government will recognise for the effects of the liquidation of the guarantee accounts; and in those cases where special clauses have not been inserted relating to this point, the working expenditure should be stipulated in relation to similar concessions where this has been done. Thus the companies must deliver to the Government at the appointed periods for the payment of the guarantee the excess of the gross receipts over the recognized working expenses of the line.

When the companies, owing to the lowness of the receipts, or the excess of the working expenses, over and above the recognized expenses, are unable to pay this balance or only

part of it, the Government will debit the companies in a special account with the amount, and interest at the same rate as the guarantee, of the difference between the gross receipts and the recognized working expenses and the amount paid in return of the guarantee; these differences will be taken into account in the final liquidation.

(*c*) If the gross receipts do not suffice to meet the working expenses the companies must make up the deficit without requiring the Government to pay anything over and above the guaranteed interest on the full capital.

(*d*) Until such time as the whole amount paid by the Government as guarantee has been returned, the Companies must not pay to the shareholders, partners or holders larger dividends than those received as guarantee from the Government according to the Law and the special contract in each case; neither must they deduct from the receipts after the actual and legitimate expenses have been covered any sums for this or any other object;

(*e*) The Companies may at any time renounce the State guarantee but they must previously return the amount received as guarantee from the Nation.

(*f*) In each railway administration of a guaranteed line there must be an auditor named by the Government, dependent of the Finance Minister, who shall perform the following duties:

(1) Draw up every half year in accordance with the General Manager or the Representative of the Company an estimate of the wages and ordinary working expenses of the line for the next half year, submitting same to the Finance Minister with the necessary remarks for his approval.

(2) To intervene in the accountant's department and note that the receipts of the line are not expended otherwise than estimated for, and that such outlays are charged in due accord with their proper appropriations.

(3) Observe that the Company acts in accordance with the tariffs in operation, requiring the Administration to at once return any sum improperly charged or collected.

(4) Agree to the accounts of the Company as presented for the collection of the guarantee, having previously verified that same are in order with the result of the working of the line and with the approved estimate of the working expenses.

(5) The salary of the auditor will be fixed by the Government in accord with the Company and will figure in the estimates as part of the working expenses of the line.

The National Congress has authorized other concessions for railways destined to cross the Country in various directions and we will now give a short notice of each one of these.

By the law of September 28th 1889 the Government was authorized to contract with Don Antonio Pelaez for the construction and working of a railway to leave Formosa where it would form a junction with the Argentine railway running through Villa Oliva, Palmas, Angostura, Carapegua, Ibitimé, San José, Ajos, Carayaó, Union, San Estanislao and would end at Bella Vista. It would also have a branch leaving Angostura and passing through Villeta, Ipané, San Lorenzo, Lambaré to Asuncion. The definite surveys and plans were to be presented within two years after signing the contract, with a statement of the conditions of the construction of the line giving details of the price and

quality of the rails and sleepers, their weight and strength, it being understood that all the materials shall be of first class quality equal to those employed in the Argentine Republic.

The gauge will be 1.676 meters and the total length of the line must not exceed 500 kilometers, inclusive of the sidings.

The Nation guarantees to the concessionaire 6 % interest for twenty years on the kilometric cost of construction of the road of $ 30.000 gold.

The guarantee service will be paid every six months and will commence to run from the time that the line is opened to traffic in sections of fifty kilometers although the various buildings may not be completed.

When the net profits of the line exceed 6 % the concessionaire will repay to the State the excess intact until the full value received as guarantee has been refunded with 6 % interest on same, the working expenses being fixed in the maximum of 55 % of the gross receipts. During the enjoyment of the guarantee the Concessionaire will fix the tariffs in accord with the Government, but once the line produces 12 % the Government alone will fix same. A telegraph line must be constructed parallel with the railway which will be opened to public service and on which the same tariffs will be charged as on the national telegraphs. The railway must be finished six years after the approval of the plans by the Government: the materials for the construction and service of the line are free of all national duties; the head offices of the concessionaire must be in the Capital of the Republic, in which place the dividends must be paid on such shares as are subscribed there. The concession is granted for a term of 55 years from the date that the whole line is opened to service,

and at the expiry of that period the whole line, stations, shops, sheds, stores and rolling stock will become the exclusive property of the State without any claim for indemnizations, the line to be handed over in perfect working order. The gratuitous concession of state lands, the right to the expropriate the private lands necessary for the installation of the line, and the obligations of the concessionaires to transport the public and official correspondence and of the Government cargoes was fixed in the same terms as established by the law of September 22nd 1887 under which the sale of the National Railway was arranged. The exemption from duties of the materials required for the construction and maintenance of the line; the arrangement by arbitration of all questions raised between the Government and the concessionaire were also similarly fixed; and the latter agreed to deposit a guarantee of $ 100,000 for the fulfilment of the obligations contracted, the amount to be returned when the works were proved to have been finished to the extent of that amount.

By the laws of September 12th 1890 and August 31st 1891 there was granted to Don Adeodato Goudra, as representative of a syndicate of capitalists, the concession to construct and work a line to leave the Villa del Pilar and run to Villa Rica, through Talavera, Tacuaros, Guayucua, Ubicuary (near Florida) Guifico, y Ibicuary, with a branch from Villa Florida in the direction of Espinola, Cabañas, Caxpucú, Ibicui, Guindi, Acahí, Carapeguá, terminating in Paraguary.

The gauge will be of 1 meter: the State guarantees 6 % interest for a term of 30 years on an outlay of $ 30,000 gold (6.000) per kilometer of line, payable six monthly, and to run from the time the line is opened to public traffic in sections of 50 kilometers. For the purposes of the guarantee the working expenses were fixed at 55 % of the

gross receipts, the concessionaire being obliged to pay to the Government at the time appointed for the payment of the guarantee the excess of the gross receipts over and above the recognized working expenses of the line open to traffic, in the same form and conditions as stipulated for this service in the law that we have already quoted of July 31st 1890. It is also stipulated that until the total sum paid by the Government as guarantee should be returned by the Company, this shall not pay to the shareholders, partners or holders a greater dividend than 6 %, nor deduct from the receipts any sum for this or any other object once the working expenses have been covered.

The time allowed for the signature of the contract of concession, having previously deposited $ 50000 to the satisfaction of the Government, was six months counting from August 31st 1891, the date of the promulgation of the law; from the date of signing the contract of concession the concessionaire had 18 months in which to present the definite plans of the line, and the construction of same must be commenced within 12 months after the approval of same and should be terminated within four years after commencement.

The Company may at any time renounce the guarantee when it may be convenient to do so, and from such time the Government will cease to intervene in the fixing of the tariffs; when the term of the guarantee has expired the State may expropriate the line with all its accessories on paying to the Company the valuation with an extra 20 % indemnization.

The clauses of this concession relating to the fixing of the tariffs; expropriation of lands; headquarters of the Company; exemption from dues on all materials necessary for the construction and maintenance of the line; the use

of the woods and other materials for construction purposes existing on the state lands; the transport of the public correspondence and Government cargoes; of the exemption from military service of the employees engaged in the construction; of the erection of a telegraph line, and finally of the arrangement by arbitration of the questions that may arise between the Government and the Company, have all been established in the same form as indicated by the Law of September 22nd 1887.

Later only we will demonstrate the great importance which the Central Paraguay Railway will have in the future as an element of quick communication between the Plate and Paraguay, once the Argentine line to Posadas is constructed, and the extension of the Central Uruguay Railway from Rivera to San Borja is carried out.

It will also form a junction with the Intercontinental trunk line, the preliminary surveys of which have just been concluded by the Committees of Engineers appointed for that purpose by the Congress of Washington, and will also establish communication between Uruguay, the State of Rio Grande del Sud and part of the Argentine. and Bolivia and Peru.

The Republic of Bolivia.

CHAPTER VI.

THE RAILWAYS OF BOLIVIA.

The railway system of the Bolivian Republic is as yet mostly projected, up to the present only one line having been constructed establishing communication between the interior of the country and the port of Antofagasta on the Pacific. This line runs across the territory of Bolivia from Ascotan, a point on the frontier with Chile, to Oruro and is 923 kilometers long; for its construction an economical type of road has been adopted of 0.75 meters guage, trains being able to travel without danger at a maximum velocity of 50 kilometers per hour.

The construction of this line has been completed within a very short time; on February 27th 1889 the general plans and surveys from Acostan to Oruro via Uyuni were approved, and on May 15th 1890 the line as far as Oruro was opened to public traffic.

With regard to the various railway measures that had been adopted up to the year 1892, the Minister of Government, Don Telmo Ychaca, on August 27th of that year, in his report presented to the National Congress mentions them as follows:

"In the various sections of the Administrative service of

the Republic during the constitucional period of 1888 is seen the action adopted by the Government for providing the country with expeditious means of communication to foster the growth of its industries by their being placed in closer relation to foreign markets.

With this object they have assisted specially the railway from Uyuni to Oruro, the inauguration of which was celebrated in May last, a progress long delayed that at last compensates for the many difficulties experienced in overcoming the obstacles opposed by the nature of our western territory.

I have pleasure in detailing the principal administrative acts referring to its construction.

On July 19th 1888 when directing the National Secretaryship in the Finance and Industrial departments, I had the honour to authorize the acceptance of the proposal presented by Don Luis M. Solá as representative of the Huanchaco of Bolivia Company.

On September 8th of the same year the concessionaire was granted the right to transfer the privilege without altering the clauses of the contract.

On February 27th 1889 the general plan of the line was approved from Acostan to Oruro via Uyuni, the obligation of the constructing company to make a branch to Allita, as soon as the works were commenced on the proposed line to the city of Potosí, being accepted.

On March 21st the deed of sale made by the Huanchaca Company to "The Antofagasta and Bolivia Railway Company" transferring the rights and privileges as mentioned in the documents relating to the extension of the line to Oruro, was approved.

On October 31st the law was promulgated conceding to the Huanchaca Company a guaranteed interest of 6 % per

annum for twenty years on the capital invested in the construction of the railway.

On November 25th the decree was issued authorizing the opening to public service of the section between Ascotan and Uyuni.

On the 10th of April 1890 it was decided, subject to the approval of the Legislature, that the term fixed by the law of the 31st October 1889 for the delivery of the Railway, should be counted from the date of the contract, the estimate and cost of the line being verified, at the proper time, by the National Department of Engineers."

" In the event of the profits from the Railway exceeding 6 % per annum, it was agreed that anything over that sum should be handed to the State in return of the amounts paid as guarantee.

" On the 11th of April last, in view of the interruption to the traffic of the line from Antofagasta to Ascotán caused by the political disturbances in Chile, the term fixed for the delivery of the line to public service was prolonged to the 15th of May, on which day it was officially inaugurated.

" In his report, the Chief of the Department of National Engineers certified to the Government that the line was solidly constructed; that the rolling stock and engines were of good quality; that the gauge of seventy five centimeters was safe with a speed not exceeding fifty kilometers per hour; that its technical features allowed the running of trains of a capacity sufficient for the purpose for which they were destined; unless the advantages of the broad gauge over the narrow, as regards capacity and greater velocity of the trains, be considered as deciding elements, when endeavoring to introduce economies which will reduce the capital 50 %, which

capital will be proportionately higher in the construction of the Cochabamba and Potosí branches, on account of the windings which render the levelling of the lines so difficult."

"The length of the railway from Uyuñi to Oruro is three hundred and fifteen kilometers; it is served by the following stations, viz: Oruro, Sebaruyo, Guari, Challapata, Pazña, Machacamarca and Uyuni, under the regulations approved by the Government on the 17.th of February for the Antofagasta line."

"It having been reported that the Company had established exorbitant tariffs for the carriage of animals and transmission of telegrams, a note was addressed to it on the 9th of June, calling on it to comply with the third clause of the resolution of July 19th 1888."

"As it is necessary that the preliminary operations referred to in the 6.th article of the resolution of April 10.th 1890 be carried out, it is ordered that the Chief of the National Department of Engineers proceed to inspect the works executed by the Company, verifiying the existing material and the true cost of the line."

"To comply with article 1 of the law of October 31.st 1889, the Government will arrange for the administrative audit for the determining of the receipts and working expenses of the line."

"The line from Antofagasta to Uyuni, established without guarantee, by resolution dated July 19th 1888, serves the public traffic in an equitable manner.

The Uyuni, Julaca and Chihuana Stations attend to its normal requirements, and its engines number thirty-nine."

The branch to Pulacayo and Huanchaca, principally intended for the transport of the metals of the Company of the same name, does not belong to the public.

PROPOSED RAILWAYS SANCTIONED.

In accordance with the law of October 15th 1890 which extends the grant of guarantee to the branch line to be constructed to Colquechaca, the right to construct a railway has been conceded to Don Isidoro Aramayo, that shall commence in the most convenient point of the main line from Uyuni to Oruro and shall run to the above town.

The obligations imposed upon the concessionaire are to make the technical surveys within one year, begin the works within a year after the plans and definite surveys have been approved, and to open the line to traffic within two years by sections of fifty kilometers. He is also required to deposit the sum of $ 30.000 (Bolivian) in one of the Banks established in the Republic as a guarantee for the execution of the work in the construction of which only first class materials shall be employed.

On the part of the Government the concessionaire has the privilege of reserved district of 50 kilometers on both sides of the line for the term of 20 years; exemption from fiscal and local duties on the construction material; free grant of the land for the construction of the line and its stations, the right to determine the starting point and the direction of the line being reserved, as also the right of expropriation on payment of the guaranteed capital with 15 % bonus.

The construction of this branch will help to foment on a large scale the growth of the industries in the noted mineral district of Colquechaca, which will in turn increase the traffic of the Central line with the bulk of its mineral exports.

Concession of February 10.th — To Don Guillermo Ugarte has been granted the construction of a railway, that will

connect the departments of Oruro and Cochabanba, within the term of four years counting from the date of the execution of the agreement of the contract of concession.

The clauses contained in same, being the same as those of all the railway concessions, cover the right granted to the concessionaire to make use of the rights of free transpot being in return compensated by the maintenance of the cart service from Oruro to Cochabamba.

If the other lines authorized have been proposed to assist the opening up of the mineral industry, the line to which. I am referring is intended to augment the existing commercial relations between the central agricultural districts of the state and the fertile valleys of the department of Cochabamba.

The length of this line is calculated at more or less two hundred kilometers at an approximate cost of L3000 per kilometer on account of the nature of the ground and its slippery composition.

It is generally allowed that the most important section is the one that runs through the Sequehalca pass, touches on the borders of Challa, Sayari and Itapaya, and ends in the Rocha valley.

As the concessionaire's time under the stipulations of the contract has not expired he has not yet presented the surveys for the approval of the Government.

Concession of June 10th 1891. The proposal of Don Lisimaco Gutierrez for the construction of the branch from Uyuni to Potosí having been accepted, the definite surveys have not yet been made as stipulated in article 2.

The surveys made by the corps of national engineers cover a length of from 225 to 230 kilometers with a maximum gradient of 25 per 1000, and a minimum radius

of 100 meters on curves. The general plan from Uyuni via Allita and Tomare to Viloyo, and via Porco to Potosí, crossing the mountain ridge of Mangui, is preferable to those proposed with a view to facilitate future extensions of the line. Its income to commence with calculated on a cost of £650.000 would be about 3 %.

Concession of October 13th 1891. The decree issued on June 15th 1890 conferred the concession on Don Fernando Cerdeña to construct a railway from the city of Cochabamba to the banks of the river Mamure or one of its tributaries in the department of Beni.

This concession grants to the concessionaire 100 square leagues of state lands, in alternate lots of 10 leagues each, situated on both sides of the line, with a view to establish colonies and agricultural settlements under the law of November 13th 1886 and reglamentary decree of March 10th 1890.

The construction of the various sections should be terminated in the year 1900, which is a rather considerable lapse of time. With respect to the terms granted for the construction of the railway from Oruro to Cochabamba it is possible that when the first difficulties occasioned to the Nation by the payment of the interest on the authorized lines have been overcome it will be found in conditions to fulfill the guarantees so undertaken.

Concession of November 30th 1890.—Under the law of October 27th 1890 that authorizes the construction of a railway in the east of the Republic by Messrs Perry Cutbill & Co. of London, the reglamentary decree was issued on November 30th of which I gave you advice last session.

Various observations afterwards made by Don Antonio

Quijarro, as representative of the English company, induced the Government to hold over the plans submitted for their approbation and they will be presented for your discussion with the latest reports.

Concession of October 11th 1890.—The navigation of the river Desaguadero and the lake Poopó having been authorized by the law of November 22nd 1887, the right to construct railways and tramways from the banks of these waterways to the populated centres and mining districts in the vicinity was granted to don Juan L. Thorndike on November 11th 1886.

The law of December 2nd extended the terms of the privilege granted for the river navigation and construction of tramways to 20 years to count from January 1st.

The concessionaire has commenced the preliminary surveys in earnest with a view to completing the works proposed.

Concession of August 1.st—By the decree of this date the right to continue the line from Oruro to the city of La Paz has been granted to Messrs. Cárlos G. Avalos, Emilio Villarino, and Luis M. Solá, under the general conditions of the law of October 15th 1890 and those specially provided as follows:

The cost of the construction materials will be fixed in accordanca with tha ruling tariff for the line from Antofagasta to Oruro.

The line must be opened to public traffic within three years counting from the date of signing the deed of concession.

The concessionaires guarantee the completion of the works by an individual and collective guarantee for $ 30000.

The minimum tariff charged must be 1 1/2 cents per 100 kilograms.

The establishment of this new line will complete the Bolivian Central Railway within the short space of five years, and it will cross the national territory transporting our products to the foreign markets by the Desaguadero and Mollendo to the North, and by Antofagasta to the South.

Concession of 22nd June.—The English Company which under the title of "The Peruvian Corporation Limited" was negotiating for the construction of a railway from La Paz to the Peruvian frontier, modifying the proposal made by the National Congress on 14th October 1890, has obtained through its agent Don Ventura Farfán, authority to make a line from the said city to Desaguadero, with a guarantee of 6 % for twenty years, after which the Government will be entitled to take it over, acquiring the right of property by paying the capital invested ont of the amount paid as guaranteed interest, and 15 % indemnity.

A condition having been inserted in the proposal that the duties payable in the port of Mollendo be made the same as those charged in the other Custom Houses of the Republic, the resolution of 22nd July last, as far as refers to the Ministry under my charge, has accepted the proposed bases for the Company, handing over to the Ministry of Foreign Affairs, to whom it corresponds, the arrangement of the condition referred to, in accordance with the treaty of commerce and customs made with the Peruvian Republic.

The concessionaires undertake to make a junction between the line from La Paz to Desaguadero and the one from Puno to Mollendo, provided that they obtain for the latter the same guarantee and privileges as were granted to the former.

The discussion which has been sustaining the theory of incompatibility with respect to the railway lines from Puno to Mollendo and from Uyuni to Oruro, in their relations with the commercial interest of the Departament of La Paz, confirms the advantages which would accrue to the Northern markets, by the extension of the Uyuni line to meet the one conceded to the English Company.

The proposal of the Peruvian corporation being accepted, as well as that of that of Messrs. Avalos, Villarino, and Solá, both lines will be constructed simultaneously, benefitting the country generally, and especially the populous Departament of La Paz.

CONCESSIONS CANCELLED.

The expiry of the terms respectively granted to the concessionaires for the presentation of preliminary surveys and failure to comply with the clauses governing the guarantee for carrying out the works, have been the cause of the withdrawal of some proposals and the lapsing of others.

The object of the following statement is to give you briefly, the administrative procedures referring to them.

By the law of October 13th 1890, the following authorizations were declared of no effect: that granted to Mr. John Firth for a railway from Tacna to La Paz; that granted, to Don José Manuel Braccu, representing Juan L. Thorndyke, for the Desaguadero line, and that granted to the North American citizen W. H. Christy for the Sotalaya lines over the Titicaca lake.

John Hurd, through our Legation in Washington, proposed the navigation of the rivers running into the Amazon, and the establishment of the railways from Cochabamba to Chimoré and from Santa Cruz to the Rio Grande, forming a connection with the Brazilian Madera—Mamoré line.

The negotations which were set on foot having been abandonned, the Ministry has refrained from dealing with the matter officially.

The acceptance of the proyect made by Guillermo de Ugarte for a railway from Oruro to Cochabamba, rendered those presented simultaneously by Santiago Secombe, Telesforo Tovar and Fernando Cerdeña without effect.

The withdrawal of the project of Messrs. Luis M. Sola and Pedro Weall for a branch from Uyuni to Potosí preceded the acceptance of that made by Lisimaco Gutierrez for the same line.

The negotiations which were carried on by doctor Antonio Quijarro, representing a Franco-Belgian syndicate for the navigation of the parts of the rivers Purús, Madre de Dios, Beni and their affluents in the national territory, and the construction of a connecting railway, were suspended on account of substantial modifications which altered the terms of the primitive project.

I do not think it out of place to mention the project of don Ernesto Rüch for the construction of a Railway from Uyuni to the Argentine Republic; nor also of the following:

Of Messrs. Emilio Reus and Victor M. Acenarro, for the establishment of lines from the Argentine Republic and Paraguay to Santa Cruz and the river Purús:

Of Antonio Quijarro for a line from Puerto Suarez to Chiquitos and Guarayos:

Of General Thomas Ogden Osborn for a line from the Paraguayan and Bolivian frontiers to the capital of the Republic.

Of August Stumpf, to extend the line comprised in the Osborn project, to the town of Huaicho on the borders of the lake of Titicaca, passing through Oruro and La Paz:

Of Carlos Müller for a line from Paraguay to Sucre, Potosí and Quiaca:

Of Adolfo Ballivian for a line from La Paz to Puno:

And of Gache, for the Ballivian port line.

In former reports I had the honor of pointing ont to you the convenience of negotiating for the extension of the Argentine Central Northern Railway to the Southern provinces this Republic.

Now that the Bolivian table land railway borders on the neighboring country, I must again make mention of that undertaking of such incalculable importance, both to the Hon. Members of Congress, and to the Government that initiated it.

In the future destinies of the country, the realization of this stupendons work will render our international relations closer, supporting them by ties of common interest, without the inconveniences attending the Magellan and Panamá routes.

The prolongation of the Plate lines by the Santa Catalina frontier to the point of bifurcation in Uyuni, crossing the province of Lipez, will realize, at no distant time, one of our greatest hopes.

Now, notwithstanding our political disturbances, that the road is opened to this class of undertakings by the initiative taken by the Huanchaca Company of Bolivia, who sub-guaranteed the capital invested in the construction of the railway from Uyuni to Oruro, and once confidence is reestablished in the promises of the Governmect, we can reasonably look for a radical charge in our financial condition.

Those countries which, on account of their natural limits are shut in and live almost completely isolated from the contiguous states, have no unity of ideas or interests with their neighbors, and do not understand any other life than that of a purely local existecce. Every government can

combat and overcome this inconvonience by opening easy roads of communication, by whose beneficent influence the hidden valley is brought inte view, and enters into relations with the neighboring lands, and its inhabitants form part of one great family, from which, up to then, they had been separated. The iron roads and the electric telegraph will finish by triumphing over time and space, which in the middle ages were very powerful agents of the dismembering of the land and of the want of unity in the Government.

As laid down in article 10 of its regulations, it is the duty of the National Department of Engineers to technicably inspect the railways.

It is of recognized convenience to endow it with administrative intervention, the right to verify the cost of construction. to revise the tariffs for passengers and goods, the liquidation and payment of guarantees, the regulation of the traffic, etc: so as to watch over the interests of the public and exact compliance with the obligations entered into.

The establishment of an office of railway statistics, will soon be rendered necessary by the development of the undertakings already commenced, by reason of the large sums they represent, and the increase they are destined to produce in commercial activity.

In the Government report for 1889, I had the honor to present to you a project of law relating to the railways of the Republic, having also published the project of the law amplifying it.

Now that the Central Railway, whose service should be properly regulated, is handed over to the public, it is indispensable that both projects be sanctioned, and this I beg to recommend for your preferential consideration.

These are the ideas of Railway initiative contained in the document which we have quoted, and public men with a well-founded conception of the great importance of the development of railways, especially in countries like Bolivia where the nature of the soil renders ordinary communication difficult, have made this question the chief of the tasks undertaken by the Government, and with respect to which, Dr. Arce, the President of the Republic has expressed hunself as follows in his Message for the past year, the last of his term, to the National Congress:

"The efforts of my administration have been preferentially devoted to endowing the country with easy and convenient roads, this being one of the chief items of the programme laid down.

The establishment of the first railway in Bolivia is already an accomplished fact: it was inaugurated on the 15th of May last, a length of 923 kilometers being opened to public service. Yon can appreciate its incalculable advantages for the interests of the country. Here yon have it within this conntries, under the very eyes of the incredulous, who four years ago thonght of it but as a dream!

I have already said and I now repeat: the execution of this work, important by reason ot the efforts preceding it, the sacrifices on the part of its initiators and its invaluable advantages for the country's prosperity, is the only pleasure which has fully repaid me for the contradictions, put forward more than once, to the industrial plan which I had proposed to develop.

I say with sincerity: the railway in Bolivia has been the constant theme of my mind, a hope experienced there for a long time, both in the anxious desires of youth and in the ideas of more mature age. It has been the only object

of my mixing in the country's politics, and its realization was the sole idea of my seeking power.

On separating myself from the management of public affairs, I only ask you not to let this powerful element of progress stop here: the necessities of the other departments demand its benefits. May the railway line inaugurated in this city penetrate into Cochabamba and La Paz and be extended to Sucre and Colquechaca; may it penetrate to all the centers of agricultural and mineral production, to the limits of our territory in the Department of Beni.

That it may prove to be beneficial and profitable for Bolivia will be my happiest reward. "

The Republic of Perú.

CHAPTER VII.

THE RAILWAYS OF PERÚ.

Amongst the States of the American Continent Perú has had to pay the highest contribution of all to carry out the construction of her railway system.

In the railway system extending from the Pacific coasts to the interior of the country, climbing the mountains of the Andes and crossing one of the most rugged districts in the world, the works have always had to be made in the face of the greatest difficulties.

Notwithstanding, the exceptional nature of the land has not been sufficient to dismay the authorities and the companies who have undertaken the construction of the lines, they being persuaded that however great may be the sacrifices required they will be amply repaid by giving to the country the means of easy communication.

This want of communication in the Republic between important centres owing to the obstacles presented by nature, the slow and expensive transport by the ordinary carts or on mules was found such a block to the advancement and opening up of the country that from the earliest times the endowment of the Republic with steam locomotion has been often projected. On June 30th 1850 Don Ramon Castillo laid the foundation stone of the first

railway in South America, on the line from the port of Callao to the city of Lima, opened to traffic on April 5th 1851 being 14 kilometers in length.

It is thus to Perú that the honour corresponds of having been the first to run a locomotive in the new world.

Following this the line from Arica to Tacna was completed by Mr. Egan, and then those from Ica to Pisco, and from Iquique to Noria: but it was during the Administration of Colonel Baltas from 1868 to 1872 that the railway industry received its great impulse, the construction of nineteen lines being commenced that it was intended should extend 2500 kilometers, and of which more than half were completed before the war of 1880, the consequences of which paralized these works which were of solid progress to Perú.

According to Engineer Bresson the average cost of the Peruvian railways is more or less $ 100,000 per kilometer, an enormously high figure only explained by the railway system covering one of the most rugged districts in the world, and by the concessions, favours and special grants made to attract the capital required for such great works in the early days of their being commenced.

Reviewing the Peruvian railway system there are three lines which stand forth as of first class; the first is the Transandine running from Callao in the direction of Lima, Oroya and Cerro de Pasco; the second establishes communication between the port of Mollendo and Arequipa, Juliaca, and Puno; the third starting from Juliaca, runs to Cuyco through Pucara, Santa Rosa, and Sicuain; this line from the direction in which it runs being one day destined to be the Peruvian Central Railway, from which the whole railway system will branch off.

For the construction of these lines the guage of 1.435 meters has been adopted and we will now briefly deal with the conditions of each one separately.

Callao and Oroya Railway.—This line runs from the port of Callao to the Monserrate station in Lima, after a run of 12 kilometers, it climbs the mountains on the banks of the River Rinac until it reaches the San Pedro Mauna station in kilometers 53.340 with minimum gradients of 3 %; from this point on, the rapid ascent is made with gradients of 3.85 % and 4.43 % for which reason heavy engines are employed capable of overcoming these very heavy gradients.

The station Cochaira is found in kilometer 75, Chicha in kilometer 160 and Oroya is reached in kilometer 209 from Callao. The minimum radius of the curves is 120 meters with a distance of 40 meters stretch of direct line between two curves in opposite directions, save in some special cases where this has been reduced to 15 meters in order to have an easier line with reduced wear and tear for the rolling stock.

The Engineer in chief of this important line was don Enrigue Meiggs. It is one of the most notable in the world, in a distance of 200 kilometers it rises to a height, not reached by any other railway, of 4779 meters, Mont Blanc only being 4809 meters high!!

With these extraordinary works there would be opened to commerce and agriculture entirely virgin districts which, once placed in communication with the Pacific parts on one side and with those of the Amazon on the other would have constituted new sources of wealth for Perú: but financial difficulties in that country have delayed the termination of the magnificent proposal of Meiggs.

Engineer Bresson in his work "Bolivia", edited in Paris in 1886, says " one of the curiosities of the Oroya rail- " way is the Verrugas bridge, an inmense viaduct crossing " a torrent of 175 meters wide by means of an iron span

" supported by three pillars, one of which is 90 meters " high or 1 1/2 times the height of the towers of Notre " Dâme in Paris. "

" The line of this singular railways runs nearly always " on a gradient of .03m. or .04m. per meter; the level or " straight stretches being the exception indeed gradients " and curves constitute the general condition of road that " from time to time climbing the zigzag or running " through tunnels comes out on imposing precipices terrible " in their grandeur. Many times the line appears like " a cornice on the sides of the Andes, on one side the " precipice and on the other a perpendicular wall of rock " towering above the aerial road. "

" With the altitudes of a few of the points we shall " better be able to comprehend the titanic nature of this " great work. "

Localities.	*Height above Pacific Ocean.*
Lima	14m.60
Quiroz	246m.40
Santa Clara	400m.20
La Chosita	854m.00
Cochachaira	1.399m.40
San Bartolomé	1.496m.03
Agua de Verrugas	1.770m.00
Surco	2.029m.60
Matucama	2.424m.75
Infiernillo	3.553m.25
Mount Meiggs tunnel	4.771m.73

The cost of this line has been close upon $ 200.000 per kilometer.

Mollendo to Arequipa and Puno Railway. — This line is divided into four sections:

(*a*) Port Mollendo to Arequipa	172	km.
(*b*) Arequipa to Vincocaya	154	"
(*c*) Vincocaya to Juliaca	150	"
(*d*) Juliaca to Puno	47	"
	523	km.

The gauge adopted has been 1,435 meters (4 ft 8 1/2 in) the technical conditions being as follows:

Minimum radius of curves	106 meters.
Maximum gradient	0 m. 400 p. m.
do. do. in exceptional cases	0 m. 436 "
Minimum tangent between opposite curves	40 m. "
do. do. in excepcional cases	15 m. "

The rails weigh 30 kilograms per lineal meter.

The locomotives in use are of the first class American type, to burn steam coal, with "Bessels" safety truck capable of hauling 62 tons of cargs (exclusive of the tare of the wagons) on gradients of 3 or 4 % with curves of 106 meters radius.

Juliaca and Cuzco Railway — The total length of this line between the two termini is 353 kilometers of which more or less 200 kilometers are opened to traffic.

The technical conditions of the line are fairly favourable; long stretches of straight line with easy gradients and curves of large radius; the ballasting has been made in almost two-thirds of the total with soft earth, the remainder being with stone. The estimated outlay for the installation of the line is $ 24:000.000.

THE PERUVIAN RAILWAYS.

Northern system.

From the port of Paita to Puira, the capital of the Departament, passing through Colón, La Huaca and Sullano.	96km.
From Puira to Sechura, open as for as Catacaos.	—
From the port of Elen to Terreñafe, passing through Monsefú, Chiclayo, and Lambayeque.	43km.492
Branch from Chiclayo to Pátapo	24km.901
From Lambayeque to Pimientel (of which there are constructed only.	25km.000
From Pascamayo to Magdalena and Cajamarca.	179km.000
From Salaverry to Trujillo	11km.000
From Trujillo to Ascope	78km.000
From Chimbote to Huaraz and Ramay, constructed as for as Suchunan	55km.000

Central system.

From Callao to Lima, 1m.435 gauge passing through Barranco and Miraflores. . . .	14km.000
From Lima to la Magdalena del Mar . . .	7km.000
From Lima to Chancay, open as far as Ancon.	33km.000
From Callao, Lima, Oroya and Cerro de Pasco, line, open as far as Oroya.	209km.000
From Pisco to Ica.	74km.000

Southern system.—1m.435 gauge.

From Mollendo to Arequipa.	172km.000
From Arequipa to Vincocaya, Juliaca, and Puno	351km.000
From Puno to Cuzco, open as for as Sicuani.	200km.000
Total.	1572km.393

In the year 1886 the Peruvian Government contracted with a North-American Company for the prolongation as far as Cerro del Pasco of the Railway from Callao to Oroya.

The termination of this line will give a great industrial impetus to Perú. The working of the silver mines of the Cerro del Pasco, renowned for the abundance and good quality of the ore will be developped as they merit, in view of the immense values they represent.

The extenssion of other railways has also been contracted, amongst which are: the Trujillo, Chimbote and Cuzco lines.

Intercontinental line.

CHAPTER VIII.

INTERCONTINENTAL RAILWAY.

At the American Intercontinental Conference held at Washington in 1889, the idea of studying the practicability or otherwise of a railway which should unite the States of this continent was one of the first matters to occupy the attention of the Delegates representing the countries of the new world.

With the object of making commercial relations closer between the American states, and by a reciprocity of interests and community of purposes, to establish strong bonds of fraternity, it was immediately decided to study the best means for establishing easy communication, both by land and sea; both points were worthy of preferential attention because it was recognized that only by means of the combined action of easy and cheap transport by sea and land that the commercial interests of American towns could be positively benefited.

A commercial interchange of produce and manufactures cannot be thought of without facility and cheapness of transport; to create the latter is to establish the former.

The railway, whose mission it is to pierce the fertile lands of America, penetrating into manufactories, to carry

the raw material and the manufactured goods to the centers of elaboration and consumption and to the Maritime or river ports, is the forerunner of great developments in these new countries; it attracts immigration, foments business transactions, creates industry, promotes commerce and gives life to towns and widens their future.

What would have become of the vast territories of the Northern of the United States, if the railways had not disturbed their silence with the whistles of their engines? They would still have been fertile districts delivered over to the savages and the wild beasts! As happens in the old Empire of Brazil, the population concentrated on the maritime shores would still have an unexplored desert behind them, like an eternal enemy to civilization and progress.

On the other hand, what a different spectacle is today offered by that great nation, with its 66:000.000 inhabitants spread over all its territory, with democratic institutions of the most advanced character, and rich by sheer effort and spirit of enterprise and work, with which it has won the well deserved renown that places it among the first nations of the world!

The collective action of a town guided by the paths of labour, and aided by the agents that multiply the efforts of man,—this is the secret of the wonderful advances made by the young towns of this continent, possessed of immense lands and innumerable riches, which have only become valuable when subjected to the miner's pick or the husbandman's plough.

The railway and the immigrant, those two units that have aided so prodigiously in the progresses attained in the new world, will always be noted as primordial factors in the development and increase of American towns.

This is already a truth which has become an axiom, and a law in modern life for towns in formation which aspire to robust, rich, and independent organizations.

It would, therefore, be the mission of the Intercontinental Railway to improve the relations between the republics possessing 12.000.000 square miles of the continent, with a population of some 121.000.000 inhabitants, and, with the development of reciprocal commerce, to consolidate the bonds of American brotherhood, breaking for ever the barriers placed by nature against free intercommunication between neighbouring countries.

This grand idea was adopted resolutely and decidedly by the majority of the countries represented at the Washington International Conference, and is one to which Uruguay should have assented without unjustifiable reservations, because in the work of American aggrandisement and brotherhood, not a single country should desert the post of honor conferred on it in the efforts and collective action demanded by great works: and much less Uruguay, which, by reason of its ports on the Plate and the Atlantic and the development of its railway system towards the interior of South America, is destined (as may be gathered from our map of the South American Railways) to make important use of the advantages of communication across the continent.

Rendering the merit of initiation, to whom it is due we will now say: that the idea of joining, by means of a Railway, the Northern and Central part of American with the Southern States was in the year 1885, long before the idea was raised at the American International Conference to treat of this important matter, proposed, and a survey and project submitted to the consideration of the Government of the United States of America, by Professor of

Natural Sciences Señor Clemente Barrial Posada of this city, which, although not specially taken into consideration by the Government referred to, was duly appreciated by the International Railway Commission. (1)

We will now proceed to detail the antecedents relating to the projected Intercontinental Railway.

At the American International Conference the report of the Committee of Railway communications which was adopted by the Conference on February 26th 1890, says as follows:

The American International Conference considers:

1st. That a railway joining all or the greater part of the nations represented at the Conference, will powerfully contributed to the development of the moral relations and material interests of the said nations.

2nd. That the most adequate means for preparing and resolving on its execution, is the naming of an International Committee of Engineers who shall survey the routes, possible, fix their true length, calculate their respective costs and compare their reciprocal advantages.

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(1) In corroboration of the above we give the following transcription of part of a letter bearing on the subject from Mr. William E. Curtis, Chief of the Bureau of American Republics, addressed to Mr. Crocker,

BUREAU OF THE AMERICAN REPUBLICS.
Department of State.

Washington, U. S. A., April 27th. 1891.

Frederick Crocker Esq.,
29 calle Rincón.

Montevideo (Uruguay).

Dear Sir:—

. . . . . .

The very valuable Report prepared by Professor Posada on the Railway project came into my hands about a year ago, having been resurrected from the files of the State Department, and it is now in the possession of the Intercontinental Railway Commission, by whom it has been read with great interest. A party of engineers is now on its way to Ecuador, where it will divide and make surveys North and South, from some point to be determined upon

3rd. That the said Committee shall be composed of three engineers appointed by each Nation, who shall be empowered to divide themselves into sub-committees and appoint the other engineers and employes necessary for the speedier completion of their task.

4th. That each of the adherent Governments may, at their own expense, appoint agents or engineers as auxiliaries to the sub-committees charged with the sectional surveys of the railway.

5th That the railway line, so far as is allowed by the common interests, should join the principal cities in the vicinity of its route.

6th. That if the general direction of the line cannot be deviated, without great prejudice, for the object indicated in the preceding article, branches shall be run joining those cities with the main line.

7th. That, in order to diminish the cost of the work, existing railways will be availed of so far as it be feasible and compatible with the route and conditions of the continental railway to do so.

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after visiting that country. The engineers have with them copies of Professor Posada's paper, and it will doubtless prove of great value to them. Will you kindly convey to him my regrets that any apparent, though unconscious, injustice may have been done him in this respect, and say that I will very gladly make reparation in the future. The proposition to construct this Railway has been received with the greatest favor by the people of the United States, and our Congress has made liberal appropriations to carry on the survey. The other Governments sent Commissioners here to confer on the subject.

I am very glad to be remembered by you, and will take great pleasure in forwarding to you the publications of the Bureau in my charge as they are issued for distribution.

If I can furnish you with any other information or serve you or Professor Posada in any way, you will be good enough to command me

I am, very sincerely.

Your obedient servant,

William E. Curtis.

8th. That should the works of the Committee show the practicability and convenience of the Railway, tenders will be called for the construction of the work, either in whole or part.

9th. That the construction, administration and working of the line be for the private account of the concessionaires or the persons to whom the latter may subcontract the work or to whom they may transfer their rights with due formality, after obtaining the consent of the respective Governments.

10th. That all the materials necessary for the construction and working of the railway be free of import duties, due measures being taken to prevent abuses which might be committed.

11th. That the fixed and movable property of the railway employed in its construction and working be exempt from all fiscal tax, whether national, State, provincial or municipal.

12th. That the carrying out of a work of such magnitude also merits being aided with subventions, concessions of lands, or the guarantee of a minimum interest.

13th. That the salaries of the members of the Committee as also the expenses rendered necessary by the preliminary and final surveys, be paid by the adherent Nations in proportion to their respective populations, according to the last official census, and in defect of census, by agreement among their own Governments.

14th. That in order to ensure freedom of traffic, the Railway be declared neutral in perpetuity

15th. That the approval of the projects, the concessions in the proposals, protection to the concessionaires, inspection of the works, supervision of the line, the neutrality of the road, and the free passage of the merchandize in transit, will be, in the case provided for by article 8, matters of special agreement among the nations interested.

Therefore as soon as the Mexican Government receives the adhesion of the other Governments to this project, it will invite them to appoint the commission of Engineers to which the second article refers, in order that they may meet in the city of Washington as soon as possible.

Juan Franco Velarde—H. G. Davis—E. A. Mexia—Fernando Cruz—Gerónimo Zelaya—Jacinto Castellanos—Andrero Carnegie—Cárlos Martinez—Silva—José Andrade—J. M. P. Caamaño—F. C. C. Zegarra—E. C. Varas—Manuel Quintana—J. G. do Amaral-Valente—José S. Decoud—H. Guzman.

In accordance with the foregoing recommendation in May 1890 the Mexican Government invited all the States on the Continent to name delegates to represent them at the international conference to be held in October of the same year.

The Argentine Republic, Columbia, Mexico, San Salvador, Perú, Ecuador, Uruguay, Paraguay, and Brazil sent delegates and three corps of Engineers were named to survey the line in the Central and South American states taking as the general plan of direction the following proposals:

UNITED STATES AND MEXICO.

The railways of these countries being already in working combination the commission has only had to study the remainder of the line endeavouring to find in Mexico the most convenient point for its continuation. The point chosen was Ayutla where the Mexican railway ends on the borders of Guatemala.

GUATEMALA.

From Ayutla the line will run down the Pacific coast passing close by Rotallmcleu and Mazatenango to Santa

Lucia. From here it will continue on the branch in construction of the Guatemala Central line to Exuintl, passing through Cujinijilapa to Santa Ana in the Republic of Salvador.

SAN SALVADOR.

In this State the line will avail itself of the projected Central line through Santa Ana, New San Salvador, San Salvador, Cojutepegue, San Vicente, San Miguel, to enter the Republic of Honduras by Guascorán.

REPUBLIC OF HONDURAS.

From Guascorán it will continue on the borders of the Gulf of Fonseca running through in the State of Choluteca, the city of the same name, from whence taking a southerly direction it will enter Nicaragua.

NICARAGUA.

In this Republic the line will touch the city of Chinandegua where it will form a junction with the railway from Corinto to the Lake Managua, continuing over this to some convenient site, such as Pueblo Viejo, and from there coasting the lake to the city of Managua, where it will take the line already constructed from there to Masaya. From here again it will continue to Rivas crossing the proposed canal and will run into Costa Rica.

COSTA RICA.

In this Republic it will continue on the banks of Lake Nicaragua running into the interior of the country by the plains of Guatusos and San Carlos as far as the city of Alajuela, where there is a branch line to the Capital.

From Alajuela it will continue over the San José and Port Simón Railway and thence by some as yet undefined route in the Isthmus of Panamá until it enters in the valley of the River Atrato in Colombia.

COLOMBIA.

When the line enters Colombia it crosses the mountains to the west of the Andes to drop down the valley of the river Cuaca touching on the outskirts of the city of Antioquia, it then ascends that rich valley linking together the numerous cities and towns that are found there until it arrives at Papayan at the head of it. In a convenient point in this part of the line it will cross the Central range of mountains to establish a branch connecting Bogotá with the trunk line. From Papaya it will run up the River Patia valley to Pasto and Itialco and from thence into Ecuador. The crossing of the mountains between Papaya and Pasto is one of the serious difficulties which the construction of the line in this Republic presents, it being in this spot where the Andes branches off in several directions.

ECUADOR.

Passing through Ecuador, the line will touch the city of Tulcan, where, running through the Central Quito valley, it will serve the cities of Ibarra, Quito, Jucumbá, Ambalá, Cuenca, and Loja, whence it will pass into Perú.

PERÚ.

The line will enter this country by the department of Cajamarca or Amazonas running in the direction of the

River Marañon down whose valley it will run to the Cerro de Pazco.

If it be not possible to run up this valley, it is intended to follow the River Huallaca to the Cerro de Pazco, the first route however being more preferable as being the shorter and avoiding the necessity of crossing the River Marañon.

From Cerro de Pazco it will run in the direction of the River Perene to a convenient point to branch off for Santa Ana, from there to Cuzco, Santa Rosa and Puno to run into Bolivia by a route round the shores of Lake Titicaca.

BOLIVIA.

In Bolivia the line will connect the towns of La Paz, Oruro, and Huanchaca, branching off from there to Chili, the Argentine Republic, Brazil, Paraguay and Uruguay.

CHILI.

The branch for Chili is already made and runs from Huanchaca to Antofagasta on the Pacific Ocean.

ARGENTINE REPUBLIC.

This branch has been already surveyed from Huanchaca to Jujuy where the system of Argentine railways terminates.

BRAZIL.

The branch with the United States of Brazil leaves Huanchaca, running in an easterly direction crosses the River Paraguay in Corumba where it enters Brazilian territory and runs up the valley of the River Tacuarí to Coxini, from this point by the line to be constructed to

Uberaba, and thence over existing lines it will reach the Capital of Rio Janeiro.

PARAGUAY.

The line connecting this country with the grand trunk line will also branch off from Huanchaca and will follow the left bank of the River Pilcomayo until it forms a junction with the Osborne concession running from Asuncion to the North of Paraguay. From Asuncion it will take the route of the line to Villa Encarnación, cross the River Paraná in front of Posadas and continue over the North East Argentine line in construction to Monte Caseros.

URUGUAY.

At Monte Caseros it will cross the River Uruguay to form a junction with the railway constructed and open to traffic from Santa Rosa to Montevideo, the Capital of the Republic, which also connects the principal cities and towns of the littoral and interior.

VENEZUELA.

To establish communication between this country and the main line a branch will strike off from the most convenient point in the Cauca valley and will run to Medellin to connect with the line in construction from that city to Port Berrio in Magdalena and thence to Bucaramanga; from there to San José de Cucutá, San Cristobal, La Gruta, Mérida, Trujillo, Basquisimeto and Palencia.

The three Corps of engineers having terminated their duties the Executive Commission of the Intercontinental

Railway reports on the results of the surveys made and this document, which justifies the practicability of the work under fairly economical conditions we will now give in full in view of the interest of same.

PRELIMINARY REPORT OF THE EXECUTIVE COMMITTEE.

The executive committee of the Intercontinental Railway Commission submit the following report for the information of the several governments interested in establishing better means of intercommunication between the republics of the Western Hemisphere. This preliminary report is simply intended to exhibit, in a general way, the progress of the surveys under the direction of the committee, as the details of the enterprise and the conclusions to be arrived at must await the completion of the field surveys and the preparation of the final maps.

The better to show this progress, the operations of the several parties will be shown separately. It will be remembered that when the full Commission adjourned in April, 1891, an executive committee of five members, consisting of Mr. A. J. Cassatt, the president of the Commission; Mr. C. F. Párraga, of Colombia; Mr. L. L., Buck, of Ecuador and Peru; Mr. Luis J. Blanco, of Venezuela, and Mr. John Stewart, of Paraguay, all of whom were expected to remain in the United States, was appointed with full and sufficient powers to conduct the business of the Commission during the suspension of the regular sessions of the full delegation. Mr. Hector de Castro, who had been appointed secretary in January, 1891, resigned to take effect June 30, 1892. Lieut. R. M. G. Brown, U. S. Navy, was appointed

executive and disbursing officer March 10, 1891, and on the 20th of December, 1892, the executive committee elected Capt. E Z. Steever, U. S. Army, who had been serving in the office as engineer since April 1, 1891, secretary of the Commission, the duties of said position to be performed, in addition to his other duties.

The executive committee has maintained in Washington a central office, which has been under the immediate charge of Lieut. Brown, assisted by Capt. Steever, and Mr. H. S. Flynn, as clerk. With this small force all the business of the Commisston has been transacted and the home expenses kept down to a minimum.

The executive committee, with the assistance of Mr. H. G. Davis, chairman of the committee on finance, and Mr. R. C. Kerens, chairman of the committee on trade and resources, have met from time to time, whenever necessary or advisable, to approve the steps already taken or to decide upon more important matters for the future. Its chairman has been in constant communication with the Washington office and has supervised the conduct of the survey through that channel.

CENTRAL AMERICA.

CORPS N.º 1.

Lieut. M. M. Macomb, *Fourth Artillery, U. S. Army, Engineer in Charge.*
Lieut. S. M. Foote, *Fourth Artillery, U. S. Army.*
Lieut. L. W. V. Kennon, *Sixth Infantry, U. S. Army.*
Lieut. A. S. Rowan, *Fifteenth Infantry, U. S. Army.*
Lieut. Samuel Reber, *Fourth Cavalry, U. S. Army.*
Lieut. C. A. Hedekin, *Third, Cavalry, U. S. Army.*
Mr. C. W. Haines, *Civil Engineer.*
Dr. W. C. Shannon, *Assistant Surgeon, U. S. Army.*

The members of this expedition sailed from New York fully equipped on the 20th of April, 1891, bound for Guatemala City, where they arrived on the 9th of May, and were cordially received and shown every attention and courtesy by the Executive and other officials of the Government.

On the 21st day of May the President of Guatemala issued the following order:

"The recommendations of the International American Conference are accepted by the Government of this Republic in so far as they refer to communications by railway, and the department of foreign relations will, in consequence, give the necessary orders to carry out these recommendations, making at the proper time a report to the national legislative assembly".

On the 22d of May Mr. Samuel Kimberly, United States consul general at Guatemala City, received a communication from the National Government, informing him that—

"The minister of public works has given orders to the superintendent of the hippodrome to place at the disposition of the International Commission of Engineers such part of the building as may be required to establish their offices and storerooms. If the members of the Commission have documents, which from their importance they may desire to preserve safely, the superintendent of the building has instructions to keep them in his office under his special care, and the official engineer, Mr. Paschke, has instructions to consult with the Commission in everything though to be of use".

The foregoing, as well as the subsequent action by the Government of Guatemala, shows the interest taken in the welfare of the work inaugurated by the Intercontinental Railway Commission.

Four young officers of the Army were afterwards detailed to assist Lieut. Macomb in making the surveys in Guatemala. All arrangements being concluded, part of the expedition started, under the orders of Lieut. Reber, with animals and supplies, to establish camps at Escuintla, Retalhuleu, and Quezaltenango. While in the city of Guatemala the engineers prepared a map of the boundaries of the city and did other preliminary and topographical work.

The actual survey began at Santa Lucía, a branch line between Escuintla and that point having already been surveyed by the Guatemala Central Railroad Company. Under date of May 31, 1891, Lieut. Macomb submitted the following outline of his plans for field work:

(1) To run a line from Santa Lucia to Retalhuleu.

(2) To examine the country between Retalhuleu and the Mexican line toward Tapachula, Mexico, via Rodeo, Malacatán, and Tuxtla Chico, thus finishing the examination of the lower line.

(3) To survey a route to San Marcos and down the Rio Cuilco toward Amatenango. The Cuilco belonging to the Chiapas drainage, its valley would offer the best line by which to reach the highlands of Guatemala from the direction of San Cristobal.

(4) To run a line up the valley of the Cuilco toward Quezaltenango and Totonicapan.

(5) Back to Guatemala from Totonicapan, examining two routes.

Accordingly, a careful instrumental line was surveyed from Escuintla, via Santa Lucia, Patulul, and Retalhuleu, to Ayutla, on the Mexican boundary, the stadia method being employed and numerous barometric observations taken at important points for the determination of altitudes. The country was covered with a network of triangles for the

accurate location of the important points in the neighborhood of the lines surveyed, and many astronomical observations for latitude also taken. Ayutlha was reached January 26, 1892, the survey to that point from Escuintla having been under the immediate charge of Lieut. Foote, while Lieut. Kennon had immediate charge of the survey of the adjacent lines and of the examination of the Cuilco region between San Marcos, Quezaltenango, Huehuetenango, and Amatenango-on-the boundary. From the neighborhood of Quezaltenango another route was surveyed via Totonicapan and Chimaltenango back to Guatemala City, and subsequently the instrumental line was taken up at Escuintla and carried via Platanar to the Salvadorean frontier."

Owing to the conditions existing in the section under consideration, Lieut Macomb deemed it inadvisable to confine himself to the survey of a single line, and therefore examined a broad belt of country in order to determine not only the practicability of a railroad, but to ascertain the best route of several that presented themselves for an intercontinental trunk line.

From the data gathered three lines are practicable across Guatemala from the Mexican boundary to Salvador.

The first is of light grades and comparatively easy construction, at a general level of between 250 and 600 feet above the sea. This would skirt the foothills and pass through forest and grazing lands.

The second is from 800 to 2,000 feet above sea level, running along the lower edge, or near the middle of the coffee belt, the richest and best cultivated district of Guatemala.

The third is through the "altos" (highlands) in the vicinity of the large cities, in a climate agreeable to our Northern people, and to those of the temperate zone generally.

Of these three lines two are pronounced good by the engineer in charge, preference, however, being given to the one skirting the mountains and passing through the coffee belt. On the lower line, via Ayutla, Escuintla, and Platanar, no serious engineering difficulties present themselves; the construction would be cheap, easy, and quick, the most important item being the crossing of the numerous streams by suitable bridges. Still, this is not regarded as the best location for an intercontinental trunk line, owing to the absence of population and products. The line along the base of the mountains and running north of Mazatenango, Santa Lucía, and Escuintla is therefore, deemed the best, as it would drain a fine country now being developed and afford a large local traffic by reason of the coffee, sugar, rubber, and fruit trade.

Tracings of the lower line have been received from the field and are on file in the central office in Washington.

Owing to an affection to his eyes, Lieut. Hedekin was relieved from duty with the corps in January, 1892, and was replaced by Lieut. Rowland G. Hill, Twentieth Infantry, U. S. Army, who reported for duty at Guatemala City, March 31, 1892. Other changes also occurred. Lieuts. Foote and Reber were relieved in April and Lieut. Rowan and Mr. Haines in August, 1892. Mr. H. J. Humphrey, an experienced draftsman was sent to join Lieut. Macomb and reported for duty in September, 1892.

After completing the survey of Guatemala that of El Salvador was commenced, the frontier being crossed in August of 1892. At latest accounts the corps were between San Salvador and San Vicente and hoped to carry the line through to Boca Culebra, at the mouth of the Savegré River, in Costa Rica, where connection would be made with the line started by Mr. Shunk in that locality.

In response to a request of Lieut. Macomb's, the United States minister to Salvador, Mr. R. Cutts Shannon, communicated with the authorities and received assurances of the warm interest taken by the Government of Salvador in the progress of the work being conducted by this Commission. Accordingly orders were issued to the heads of departments to give all possible aid, to the custom-house officials to admit the property of the surveyors without duty, while the free use of the telegraph for official business was also tendered. Mr. Tomasso Stech Bonellé, Government engineer, was assigned to duty with the corps as consulting engineer.

Lieut. Macomb, under date of August 11, 1892, reported from Santa Ana as follows concerning the condition of railway construction in Salvador:

" The Government line from Acajutla has been extended to La Ceiba, a point about 5 or 6 miles west of Santa Tecla or Nuevo San Salvador. Between Santa Tecla and the terminus at La Ceiba is some heavy work requiring some viaducts and a couple of tunnels. From Santa Tecla to San Salvador the railroad grade is complete and it is now operated as a tramway, with mules. The Government engineer is at present busily engaged on this final piece of work which will place San Salvador in connection with the seaport by an all-rail route. Now it is rail to La Ceiba, stage or horseback to Santa Tecla, and tramcar thence to San Salvador, the whole trip taking about six hours."

" It is considered certain that the line will be completed."

" Mr. Albert J. Scherzer's line starts from the Government line, at a point west of La Ceiba, and swings around to the northwest, terminating at Santa Ana."

" Mr. Scherzer has just returned from Europe with the necessary capital and with much material ordered to complete this line, and it is regarded as a sure thing."

" The French company's line extends from the capital to La Unión, the seaport on the Gulf of Fonseca. They have only made reconnoissances, however, and have done no work. "

" These are the lines with which we will have to connect, but thus far we have been unable to get any complete maps from any of them, and probably none exist. It is a difficult thing to make a satisfactory connection or show the Commission how our work connects with that proposed without maps. That is the great trouble we have encountered thus far in trying to make use of other work, the records and maps are incomplete and inaccurate. Hence we have had to do over, in some cases, work which has been done once before, but of which the records were lost through some carelessness. "

" I hope to be able to find a feasible line from the west boundary of Salvador connecting either with Santa Ana or Sonsonate. "

" This done, I think we may assume that the route as far as San Salvador is fixed. Our work then will consist in finding an acceptable route to Guascorán. There will be some heavy work required here, but from Guascorán to Chinandega I am informed that the country is flat and favorable for railway construction. "

" I will forward a report of our preliminary work between Escuintla and Santa Ana as soon as I can get the data in shape. Mr. Hill and I have been over some rather unhealthy country. During the last two weeks I have been incapacitated for field work for some days, and am now under treatment. Mr. Brooks (quartermaster, etc.) was very ill for two weeks, and several of the natives have been down. Mr. Hill is still well and has been free from attacks of fever. Messrs. Kennon and Shannon have

been working in the higher country and report themselves well. "

" I have not asked for any more officers because I believe we can work more economically as we are. "

Under date of September 22, 1892, Lieut. Macomb reported as follows:

" I went over with Mr. Scherzer, the best railroad man in this country, and saw just where he proposed to locate his line from Santa Ana toward San Salvador. "

" He is doing his work so well that I shall connect with it by triangulation and not resurvey what he has done. We soon shall start into the east of San Salvador, toward San Miguel. Here the country is exceedingly difficult and, it is said, impracticable, but this is what we shall find out during October. Just now the roads are horrible—mere ditches of mud and water, and worse than in Guatemala last year, because there has been a good deal more rain here. I expect to reach Managua in latter part of November or first week in December. "

Under date of November 16, 1892, Lieut. Macomb reported that—

"I estimate that it will take us until the end of June next to complete our work and connect with Mr, Shunk's initial point. I understand that he is now working south from San José de Costa Rica, and I expect to connect with the Costa Rican Road at San Ramón".

"We have collected a great deal of material of interest bearing on the regions through which we have passed and the topographical works has been very carefully done and is based upon a net of triangles. For the credit of all concerned and to give a permanent geographical value to our work, I consider it important that triangulation should be carried to the end of our line. In no other way can

such good results be obtained. When our notes are finally reduced the geodetic positions of all the main points in the vicinity of our line will be determined, and on this basis will rest our final plans and profiles".

"To make an intelligent selection of an acceptable line through this country requires a very careful preliminary study of the topography, which should be laid down in all the detail which the character of the work permits. Upon this map, with the personal knowledge of the country acquired in actual field work, a good location can be made."

In order to sufficiently expedite the work of Corps No. 1 so it might complete the survey of Central America within the time and within the funds at the disposal of the Commission, instructions were dispatched to Lieut. Macomb to discontinue his triangulation and to confine his work to that of a preliminary railroad survey. Accordingly he closed out his system of triangulation by the occupation of the volcano of San Vicente, which gave direct connection with La Libertad, one of the best determined points in that section. Lieut. Kennon was then detached and sent to Punta Arenas, Costa Rica, with the necessary equipment and with orders to organize a small party, seek Mr. Shunk's initial stake on the Rio Savegré, near Boca Culebra, and work northward, running a good transit and stadia line until connection should be made with the main party coming southward. It is estimated that Lieut. Kennon wil have about 200 miles to cover during the months of February, March, and April, while the main party would survey about 280 miles and be in the neighborhood of San Juan del Sur by the 1st of May, with its field work completed.

It is not intended to duplicate any work now completed

and accordingly the existing line of the Nicaragua Railway from Chinandega to Granada will be accepted as it stands. It is understood that our minister, Mr. Shannon, was about to secure, for the use of our surveyors, tracings and other data covering not only the operated lines, but also those studied, although not yet constructed.

Lieut. Macomb had connected, at Sitio del Niño, with the Scherzer line, now being built between Ateos and Santa Ana, and had run a line north of the volcano of San Salvador. The capital being difficult of ingress and egress, Lieut. Macomb is of the opinion that it would be better to put San Salvador on a spur rather than attempt to build a trunk line through it. Under date of January 6, 1893, the chief of Corps N.° 1 reported that his party were working along the slopes of the volcano of San Vicente, a fine peak, with much ground available for coffee, indigo, sugar, and cattle, and possessing a good water supply. The line run would pass within 2 or 3 miles of the town of the same name and thence probably via Usulután, near the coast, continuing to San Miguel through a good railroad country, and one sufficiently rich to afford good opportunities for future development. From San Miguel the line is expected to proceed via Santa Rosa and Pasaquina towards Nacaome, in Honduras, thence to Choluteca, and finally to Chinandega, thus connecting with the Nicaragua railroad. On reaching this latter point the survey would be discontinued and resumed again at Granada, the farther terminus and thence continued towards the head of the Rio Tempisque in Costa Rica, and so on to Punta Arenas, or some other point, to a junction with Lieut. Kennon's section.

SOUTH AMERICA.

CORPS N.º 2.

WILLIAM F. SHUNK, *Engineer in Charge.*
ROBERT BURGESS, *Assistant.*
WILLIAM J. O'CONNELL, *Topographer.*
JAMES PARKER, *Assistant.*
D. M. MARTINEZ *Assistant Topographer.*
FRED N. OGDEN, *U. S. Navy, Surgeon.*
THOMAS F. DEMPSEY, *Rodman.*

This party, under the direction of Mr. William F. Shunk, was assigned to survey the country from Quito, Ecuador, northward and through Colombia toward the Isthmus of Panama. Being fully equipped, it sailed from New York on the 10th of April, 1891, for Guayaquil, Ecuador, which point was safely reached on the 25th of the same month. At Guayaquil the governor of the province and the United States consul-general did all in their power to assist the party. Many unavoidable delays were experienced, but the Government offered transportation and every possible facility to convey the surveying corps to Quito.

The distance from Guayaquil to the capital is about 270 miles, there being rail communication as far as Chimbo, but the rest of the distance, about 200 miles, has to be covered by means of horses or mules.

The governor of the province and his staff accompanied the party on the first day out from Guayaquil. The central government issued orders to the authorities to facilitate the progress of the engineers and no efforts were spared to carry out these instructions.

On the 3rd of May Riobamba was reached and the governor of the province of Chimborazo called to welcome the party. To return in some degree the many courtesies received, the surgeons attached to the surveying corps lent,

on various occasions and gratuitously, their professional services.

Quito was reached on the 6th of May. A committee of citizens, appointed by El Señor Antonio Flores, the President of the Republic, met the party and escorted it to the city. During the stay at Quito government officials and private individuals were constantly extending hospitalities and courtesies to the members of the surveying parties. After consultation with the minister of public works, who furnished Mr. Shunk with maps and other valuable information, the necessary arrangments for starting having been made, the first camp was established at a point 3 miles from Quito for the purpose of completing the organization of the working parties. The temporary ill effects produced by the great altitude of this region soon disappeared and the work began in earnest.

The initial stake of the survey was set in the southeastern suburb of Quito, June 3, and a daily average progress of 2 1/2 miles made to Ibarra, which was reached July 12, 1891. The geological character of the country is aptly described by Mr. Shunk in the following words:

" This whole plateau valley, together with its outer slopes on Amazon and Pacific waters, appears to have been built up coordinately with the gradual lift of the volcanic border peaks; and those volcanoes delivered, almost exclusively, mud and dust. The surface material therefore, for an unknown depth, is mainly clay of some kind, white, yellow, and brown; and black seams of comminuted pumice occur, and beds of clayey conglomerate, holding angular porphyry and trachyte blocks of all sizes, from a piece of chalk to a house, stiffened in the argillaceous matrix to a half-rock, the consistency of hard pan; here and there strata of water-rolled gravel and shingle; very rarely, and

low down, a streak of lava. Little outcropping rock is visible, excepting the high up ridges and crater rims, and all such rock is porphyritic. The viscid mud discharge came to rest at a moderate inclination, and the volcanic dust showered down on it for the most part crosswise of the valley before the prevailing easterly winds, thus raising or helping to raise the "nudos," or knots, which tie the cordillera parallels together and form the chief obstacles to a good railroad line. The original declivity of this earthen output was 12 or 15 degrees at top to where it abutted with the steep crater cone; thence it gradually flattened to about 5 degrees at the base. "

" Before weather-wear began, assuming that to be supposable, the topography must have been not unlike the surface of a row of hippodrome tents set end to end, 30 to 50 miles wide and 50 to 100, or upwards long; where two touched, a nudo; the tuck-up poles baptized Chimborazo, Tunguragua, Cotacachi, and so on. Erosion, however, has done marvellous sculpture on this symmetrical mold. It seems to have begun at the summits, where rain and snow began most vigorously. The tendency was to form an annular depression about each central cone, a ring pond overflowing at low spots. Hence broad based, smooth and cultivable triangles of the ancient surface surround every typical peak or crater, their points upward, like the cloven calyx of a rose against the bub, with abrupt counter-slopes, and divided by chasmal ravines narrowing downward to cañons. Good drainage has preserved these significant surfaces and plenty of it has scoured the cañons deep, not only on the mountain flanks, but across the plains and down the outlet valleys to ocean or river Along the lofty ridges between those old craters, dead and alive, the same tendencies and effects are manifest, diversified,

however, by occasional concentration of wash in the coves and immense landslides, either rewrought were they fell or dissolved and distributed over old lake bottoms to reappear for us as plain country, the garden ground of the Republic. "

" These mountains are grassed, but treeless; above the shrub limit, pale green with dashes of tawny; then shrubs of the myrtle kind, on the lower declivities, chiefly in the coves and ravines; then the fat pastures of the plain, grain fields, gardens, clumps of fruit trees, and everywhere the eucalyptus as a feature in the landscape almost as characteristic as the adobe fences, topped with cactus and maguey. "

" It is remarkable that all surface material here seems to make "adobe" and stands, very much like our "bluff" along the Mississippi, near Vicksburg and Natchez, at the vertical or at slight deviations therefrom, scaling hard where exposed and greening over with a finely textured protective moss. "

" The breaks or "quebradas," as they are locally called, which net the country wherever water runs in the wet season, invariably have a tin-funnel cross-section, slant above, wall-sided below, whether 10 feet deep or 500, dropping as a rule abruptly from the surface to an angle of forty-five degrees and rounding down to the perpendicular; so that, in our experience, a trifling ditch to appearance usually proves impassable by horse or foot as a profound chasm. The stream, too, is always sinuous, the tusks and indents looking like the teeth of a porpoise or the sutures of a skull. Another feature is that they rarely shoal up stream, so that in most cases economy can not be gained by swerving the line."

The first hundred kilometers average each an estimated cost, for grading, masonry, and bridges, of $20,000 equivalent

to about $32,000 per mile, and require no gradient exceeding 31/2 per cent.

From Ibarra the line was carried forward by way of Toquando and Chota valleys, over difficult ground, consuming considerable time; the stay in the pit of Chota—only 2,500 feet above tide, amongst barren clay hills—being anything but agreeable. On the 23d of July the corps was divided into two sections, section 2, under Mr. Burgess, continuing line of survey up Chota and Huaca valleys, while Mr. Shunk, with section 1, advanced to the neighborhood of Tulcán and started another line northward from the southern side of Nudo de Huaca, about 9 miles south of Tulcán.

At Tulcán, as at all other provincial capitals in Ecuador, the governor courteously offered his services to the representatives of the Commission. Before crossing the frontier of Colombia, the prefect of Obando, the southernmost province, sent his card and placed himself at their orders. Soon after arrival at the first camp north of the boundary the surveyors were visited by a committee of citizens of Ipiales, offering welcome and bearing a letter from Señor Barbaro, the prefect of the province. Next day Mr. Shunk and his comrades called, by appointment, upon the prefect, and were most cordially welcomed and entertained at luncheon.

From Nudo de Huaca Mr. Shunk's line was carried across the Rio Telles, near its junction with the Guaitara by way of the latter stream, the Guapuscal and the Chimbatangua, to the village of Tanqua; thence turned southward and doubled into the valley of the Taruqui, where another return was made southward, followed by a final one north to the great "pastures," near the village of Tacuanquer, thence to the summit up the southeastern flank of La Galera, a distance of about 25 miles on a

gradient which should not exceed 3 1/2 per cent on location, with two or three intermediate slacks. Ten miles of like gradient carries one down to Pasto, about 80 miles from the start near Tulcán, and 216 miles from Quito. The sucessful conduct of the line to Pasto, overcoming the most difficult, probably, of the summits, was therefore happily effected. This involved the ascent of the flank of "the huge ruined cone of La Galera, 15,000 feet above tide, forming a pit 4 or 5 miles athwart, being itself on the rim of a still more stupendous ruin, threefold that diameter, its edge slightly dipped toward the south cloven by Pasto River toward the north, and inclosing a circular tract of hill country benching down 2,500 feet vertical to the exit of drainage northward where the city stands. Viewed from the south, therefore on Guaitara waters, the summit, heretofore unsuspected, appears to be a wall of mountain, slightly saddled or wind gapped." It remained for Mr. Shunk's party to be its discoverer, and using the privilege of such, named it La Cima de Santa Gertrudis.

The alternative to the upper Guaitara route, run by Mr. Burgess, via Tuquerres, compares with the line run by Mr. Shunk, in length about 50 to 30.

Having carried the line prosperously into Pasto, the problem was to get successfully out, for the "next stage of the survey required the crossing of the profound valleys of the Juanambú and the Mayo, divided by a lofty cordillera, to the valley of the Patía. North of Pasto, the basin in which the city lies is bounded by a high ridge, formerly connected with La Galera, now traversed by Pasto River in cañon. The whole country north of that bounding ridge tumbles down 6,000 or 8,000 feet within 15 miles to the Juanambú, flowing westward, and in the main is heavily

timbered and beset with spurs ranging north like the teeth of a comb." However, owing to the intelligent studies of Mr. Shunk, he found a small brook, the Chichatoy, flowing westward, about two and one-half miles in length, into the Pasto River, north of the high ridge bounding the basin wherein the city lies, and giving access to the comb-like spurs near their roots, and thus enabling the engineers to avoid doubling ridges and ravines along three parallel affluents of the Juanambú, and owing to a long bend southward on the upper course of that river, above their mouths, to approach it near Tablon, thereby largely reducing the necessary descent to a crossing.

" The neighborhood of Tablon is a ruling objective, whether the old Arenal Summit, the thoroughfare for generations between the Juanambú and the Mayo, be crossed or one of the streams from the great divide further east be followed. The ascent to the Arenal exhibited a wilderness of sharp set ridges and hollows. The Vado, eastward, was perceived to be a cañon water, equally uninviting, besides heading up in the wrong direction, without counter sloped watershed. The Quiña, largest of all the tributaries in that quarter, appeared unquestionably to be the preferable route and was so found; the summit as low as Arenal, sharp edged and indicating a tunnel about 2,500 feet long. The neighborhood of Tablon was surveyed extensively to provide a reserve of development, if needed. The upper valley, however, proved to be a plain, level athwart, about 300 meters wide and having a quite regular inclination of 5 degrees. Taking advantage of this topography and of a suitable located lateral ravine, it proved better to develop there rather than at the foot of the valley, thus gaining 2 miles of distance by means of a flaked line on comparatively inexpensive ground and attaining the proper elevation for the tunnel. "

" The Quiña Valley was shaley and slaty, the hills rounding down very uniformily in profile, though cut by drainage, with an increasing pitch toward the stream. North of the tunnel, on the Mayo slope, the surveyors traversed a region of crumbly clays and soft pumice rock very much weather worn. True contours would lie in bights between thin-nosed spurs like a slack clothesline between its props. The concaves are fittable, as a rule, by our curvature: cuts through the points deep and short. The Mayo at the crossing, about 6 miles north of La Cruz, is a 60-foot stream in cañon valley, 800 feet wide and 300 feet deep, requiring a viaduct of that size. At the end of 10 miles (16 kilometers) down the valley it began to break into impassable cañon and fingery, wall sided spurs, which were avoided by turning through a short tunnel into the valley of Las Palmas. "

Seven miles additional brought Mr. Shunk to a junction with the alternative line surveyed by Mr. Burgess, said junction being about 76 miles (121.6 kilometers) from Pasto, by measurement of an approximate location on the field maps. Free use of curvature, a course clearly prescribed by both physical and commercial considerations and the line skillfully located, the cost of these 76 miles north of Pasto will, in the opinion of Mr. Shunk, not exceed the average previously given for the reach north of Quito, while the maximum gradient required will be less than 3 $^1/_2$ per cent.

Material for masonry exists in the stream beds. Timber for ties is convenient and sufficient, except in the Las Palmas Valley, where the supply is scanty, limited to small groves in the lateral ravines.

From Las Palmas the line was carried via Cuevas to Popayán, situated at the head of the Cauca Valley, camp being pitched near that city December 4th 1891. South

of Popayán the line crosses the ridge of Roble, which is the divide between the headwaters of the Patía River flowing into the Pacific Ocean and those of the Cauca emptying into the Caribbean Sea. Ridge of Roble also connects the oriental and occidental cordilleras. From Popayán the survey was conducted via Cajibió to Cali, which was reached January 18, 1892, the división of the corps into two sections materially increasing the rate of progress of the work.

The distance from Quito to Cali by the Guaitara route is about 490 miles (788 kilometers) and by the Tuquerres route 530 miles (853 kilometers) making an average of about 70 miles per month, commendable progress, when one considers that the route lay through some of the boldest mountain regions of South America.

Concerning the section between Quito and Popayán, Mr Shunk is of the opinion that $ 32,000 per mile ($ 20,000 per kilometer) would be a fair valuation for grading, masonry, and bridges, provided the line were well laid in gross and carefully located in detail; that such a line exists, awaiting the finder; and that it must be found eventually if the road is to be built, as there does not appear to be business in sight or in the near prospect to warrant a larger average outlay, if even an outlay so large. That sum in the United States would prepare the roadbed through pretty difficult country; the grades and curves admissible in Ecuador and Colombia go far to offset the peculiar obstacles encountered. Good drainage would be a prominent item of expense. On the other hand, cuts can be taken out to steep slopes in that frostless region, judging not only by the character of the material in place, but by work already done on the highways, whether by storms or by hand. As a rule, the steeper the pitch the

better it stands. There would be three tunnels required on the section now under consideration. One about a mile in length under Boliche Summit, another 2,500 feet long under Quiña Summit, and a short one under the Ridge of Roble.

In regard to the reach between Popayán and Cali, Mr. Shunk reports that there appeared to him to be three alternative lines awaiting examination:

" First. A detour by way of the Cauca River from Popayán to Paso la Bolsa, north of Buenos Aires. Second. From Popayán across country by way of Duende or vicinity to the valley of the Piendamó, thence to and along Cauca River to Paso la Bolsa. Third. From Popayán along the foothills of the central cordillera adjacent to the national road north, by way of Jimena, to the ridge between the rivers Piendamó and Tunía, thence along that ridge to the vicinity of Aganche, whence a descent may be made along the southern flank of the valley of the Ovejas to the Cauca near Jelima and thence to Paso la Bolsa. At the latter point the valley opens. There is plain ground and no difficulty to Cali. "

" Before location, the Ridge of Roble, with the neighboring country between Los Arboles and Popayán, deserves particular study, for there are several alternatives inviting attention. Of course but one could be followed. "

From Quito to the vicinity of Los Arboles, Shunk is of the opinion that the line actually run is pretty near the right ground, assuming it to be inadmissible to put Quito itself on a spur.

Corps N.º 2 started the line north from Cali January 25, 1892, and in three weeks achieved the distance thence to Cartago; making, in round numbers, 24 miles (39 kilometers) the first week, 60 miles (96.6 kilometers) the second, and 40 miles (64.4 kilometers) the third week.

They were delayed more or less by foul weather, and, on the reach between Cali and Palmira, by exceedingly difficult ground to get over rapidly. The Cauca there traverses a sodden flat through dense wilderness containing a network of high-water sloughs, lagoons and bayous. The road was very devious, but was necessarily followed. The bridges on it had been swept off by freshet two and a half years before, a circumstance that so obstructed transportation that the progress of camp regulated the progress of the survey.

Owing to the frequent fords or portages in mud or water, averaging probably 500 to 700 feet asunder for a long distance, camp moved slowly.

These 124 miles (200 kilometers) are without serious obstacle to cheap construction. The Cauca River near Cali, requiring a bridge 450 feet (137 meters) long, and the flood waterways to be provided in the vicinity of the river, make the division from Cali to Palmira more expensive than that from Palmira to Cartago.

"Throughout the latter the alluvion of the valley, a plain sloping toward the main stream at a declivity almost imperceptible, borders the foothills along a winding line of demarcation with curves and indents like a sea margin. The railroad would cross those bays and coves on fast ground, with hillside excavation around the capes and through cuts through the occasional isthmuses, pretty largely in a gravel formation good for ballast. It is a well-watered country, rivers and brooks from the central cordillera abounding, and will neccesitate ample provision for drainage. Timber convenient for ties and material for masonry obtainable from the water channels."

An approximate estimate places the 440 miles (708 kilometers) from Quito to La Bolsa crossing of Cauca

River, south of Cali, at the previously given net rate of $ 32,000 per mile ($ 20,000 per kilometer) for grading, masonry, and bridges; thence to the 487th mile (784th kilometer) at Cali, $ 16,000 per mile ($10,000 per kilometer), and thence to the 611th mile (983d kilometer) at Cartago, $ 13,000 per mile ($ 8,000 per kilometer).

The survey was carried to the camp of the corps, 1 1/2 miles north of Cartago, at noon of February 15, 1892.

At this point the party was divided, Mr. O'Connell continuing the line northward, while Mr. Shunk set out on an exploration of the Quindió Pass in search of a feasible route into the Magdalena Valley. On his return he overtook the main body February 27 at camp north of Manizales, finding in charge Mr. J. D. Garrison, sent out by the Commission to relieve Mr. Burgess, resigned.

The main road between Cartago and Medellin was followed by the line as far as Calamina, where a crossroad permitted access to the western side of Cauca River at Marmato, from which point progress northward was made by way of New Caramento, Valparaiso, the Farralones, Santa Barbara, and Caldas, to Medellin, the suburbs of which were reached Saturday, March 19, 1892, and the line extended through it on the 21.st

" It should be observed that the survey northward from Cartago, being restricted to the public road, traversed a rugged region crosswise of torrent drainage from the Paramos and Nevadas of the central cordillera, and for the most part out of sight of the true field along the Cauca Valley, over ground quite impracticable for a railroad at a reasonable cost, except the reach between Cartago and San Francisco. A location could be found there descending the Chinchina River from the latter point to Cauca Valley.

Mr. Shunk, however, judges such a line inexpedient. Without apparent advantage of any kind it must be the longer and more expensive alternative, and would enter the valley near head of what it considered its worst portion, avoiding, therefore, no difficulties of importance.

Mr. Shunk had contemplated trying a line by way of the Risaralda and San Juan valleys, but a report on that country by Mr. Frankin White, presented at Palmira, caused its dismissal. Mr. White's reconnoisance, made in 1878, indicates a gradient of 7.7 per cent for about 9 miles (14.4 kilometers) at the summit, an ascent thither from the mouth of the Risaralda approximating 4,300 feet (1,310 meters) vertical, and a descent thence northward to the mouth of the San Juan of 6,700 feet vertical (2,042 meters). The valley line, on a continuous descent, would obviously consume the difference only between those figures, or about 2,400 feet (731 meters), distributed over a length of more than 100 miles (160 kilometers). The interior lines as tabled by Mr. White, seem to be the shorter of the two by about 8 or 10 miles (13 or 16 kilometers), a difference which it is thought would be more than extinguished by the development necessary to reduce gradient within the limith prescribed. On a whole, the valley line is deemed preferable to any other. The scheme of the work forbade an attempt to examine its roadless, wilderness declivities, and smoky Indian-summer weather prevented good views of it from the overlooking upland; but such glimpses as were obtained, the observations made at the crossings, and the information of residents satisfied Mr. Shunk that although there may be occasional bluff spurs or pricipitous cañons, a road can be built there at moderate expense. Much, if not most, of the "cañon", so called, is firm hillside for casting work, and there are numerous reaches of "bench"

or "bottom". Yet in the uncertainty of the knowledge acquired, the division from Cartago by way of the river to the mouth of the Poblanco, in round numbers 100 miles (160 kilometers), is estimated at $ 32,000 per mile.

After his arrival at Medellin Mr. Shunk reported upon his explorations and studies of the passes leading from the Cauca into the Magdalena Valley. From these it appears that while descending the Cauca the possibility of finding a line thence up the Paila Valley, or that of the next affluent northward, which would favorably approach a low summit of the central cordillera at the head of the Rio Coello, a tributary of the Magdalena, was suggested. From Mr. White, many years resident in the State of Cauca, the best information concerning the country in the neighborhood was obtained. He confirmed the conjecture that either from Cartago or the Paila vicinity a lower pass than that of the Quindió would be found to the southward. He added that the ground in the valley of the Coello and its affluents offered easier construction than the valley of the upper Toche, northwest of Ibaqué, the latter being greatly cumbered with bowlders and other débris from the volcano Tolima. The distance by each of the general routes from Cartago to Ambalema, whether by the Quindió Pass or by the headwaters of the Coello would be about 125 to 130 miles (200 to 210 kilometers). Judging the ascent from Cartago to the Quindió Pass, at the time of his reconnoissance, to be decisive of the feasibility of the work, Mr. Shunk, did not extend his journey beyond that pass. The summit tunnel under Quindió would approximate 2,500 to 3,000 feet in length, and would put the railroad 800 to 1,000 feet underground. The material to be penetrated is compact blue slate and shale. By reason of the flattening off of the eastern

ravine a much lower tunnel would be greatly longer and therefore inexpedient. On the approach to Quindió Pass from the westward there would be light valley work from Cartago to the vicinity of Salento; thence to the tunnel heavy and curvy. Massing those subdivisions, Mr. Shunk, thinks that $ 32,000 per mile (20,000 per kilometers) would cover the cost of grading, masonry, and bridges; and that, as an approximate valuation, that rate might be used for the entire distance between Cartago and Ambalema, about 130 miles (210 kilometers).

The general map of Colombia seems to offer an alternative line southeastward instead of northeastward from Ibaqué to the Magdalena River, which line should ascend to the national capital by way of the Rio Bogotá.

Owing to impassable roads Mr. Shunk, while at Popayan, was upable to explore Guanacas Pass, but from information obtained it is believed a railroad is feasible from Popayán, in the Cauca Valley, to La Plata, in the Magdalena Valley, via this pass. The ridge of Guanacas is believed to be between 1,000 and 1,300 feet above the waters of Palace River, and this would imply a tunnel of about 1 to 1 1/4 miles long, provided an exit eastward at an elevation of 11,000 feet might be made. The elevation of Lago de Guanacas is given by the French expedition as 11,590 feet (3,533 meters), and it is assumed that the lake stands 500 or 600 feet above the stream into which it flows, and from which it appears to be distant 1 1/2 miles. This assumed tunnel elevation could be surmounted well within the rate of limiting gradient, so that there is room for movement up or down in this conjecture without seriously dislocating the conclusions. The distance from Popayán to the tunnel is placed at 40 miles (64 kilometers), and thence to La Plata at 60 miles

(96 kilometers). The cost of grading, masonry, and bridges from Popayán to La Plata, inclusive of a tunnel 1 1/4 miles long (2 kilometers) at the ridge of the Guanacas, would not exceed $ 40,000 per mile ($ 25,000 per kilometer). Below La Plata there would be no difficulty to the sea as to gradient. Doubtless there are other passes into the valley of the Magdalena, both north of Popayán, but time did not permit a search for them.

The surveyors were welcomed and offered service by alcaldes of towns and prefects of provinces, under orders from Bogotá, and the director of national mails and telegraphs gave the freedom of the wires in Colombia. At Pasto a formal reception and lunch, as at Ipiales, was tendered, courtesies were shown at Cartago, but especially at Medellin was the reception most hearty and cordial. The governor of the State had the engineers to breakfast at the Executive Mansion, an entertainment begining at 1 p. m. and not ending till 6, with a distinguished company to assist. Then the business men tendered a supper, an elegant collation, a very solid assembly and an interchange of goodly expressions from 6 p. m. till midnight. This was followed by courtesies from the president of the School of Mines and the municipal council, together with numerous acts of kindness on the part of other individuals, including the American and foreign consuls.

At Medellin the corps was again divided into two sections, each taking the field at the beginning of April. Section I. under Mr. Shunk, went by way of Antioquia to Cañas Gordas, on the river Sucio: thence, returning to Antioquia, extended the survey southward up the left bank of the Cauca River to the ferry on the trail between Concordia and Titiribí, arriving at this rendezvous May 10. Mr. Garrison, with the second section, joined a few days later,

having surveyed a line from Caldas by way of Fredonia to the mouth of the river Poblanco; thence through Jerico to the San Juan River, at the mouth of the Quebradona, and thence through Bolivar to the "Quiebra" summit of the western cordillera. He then connected his line through Bolivar by way of the Cauca Valley to the ferry above mentioned and returned to Medellin. Both had a good deal of foul weather, and Section II suffered from ill health.

" From the mouth of the Poblanco, on Cauca River, 711 miles (1,145 kilometers) from Quito, or from Cauca River at the mouth of the San Juan, 20 miles (32 kilometers) down stream from the former point, a branch to Medellin would be feasible, the length of it the same by both lines, namely, about 46 miles (74 kilometers). The first line would ascend the Poblanco Valley, pass the summit in San Miguel Ridge near Fredonia, detour the heads of the Sinifaná, pass a depression in the spur projecting westward from the central cordillera near Awagá, ascend to a saddle in said cordillera at the source of the Quebrada Lejia, a few miles south of Caldas and run thence by way of that town down Medellin River to the city of the same name. "

" The second line, descending Cauca Valley on its eastern slope from the mouth of the San Juan, would ascend the southern slope to the Sanifaná Valley to a junction with the Fredonia alternative near the river sources. The latter line appears to be preferable as occupying better ground, accommodating the country side better, and as being free from objectionable counter gradient. Both lines would serve the unique coal deposit of the Sinifaná Valley. "

One or the other of these two lines seems to be the only practicable approach to Medellin from the Cauca Valley in this region. Mr. Shunk's studies along the road between

Medellin and Antioquia revealed a topography insuperable by a railroad at a reasonable cost.

"From the mouth of the San Juan the line through or near Bolivar encounters no especial difficulty until that town is passed. Development then becomes necessary to overcome the abrupt rise of the cordillera to La Quiebra summit, about 2,000 feet vertical (610 meters) in a horizontal distance of 1 1/2 miles (2 1/2 kilometers). Support for such development is offered by the Quebrada Linda, southward. West of the summit the country slopes off with a moderate declivity and there would be no great difficulty, according to information, in the way of a railroad thence to Quibdó on the Atrato, about 60 miles (97 kilometers)."

From the mouth of the Río San Juan the main line descends Cauca Valley on its western slope, over ground alternately bluff, bench and bottom, cloven by frequent streams or dry beds of torrent streams, 50 miles (80 kilometers) to the city of Antioquia, 781 miles (1,257 kilometers) from Quito. Thence it develops up the valleys of the Rio Tonusco and its northern affluent, the Toyo, to a tunnel 2,500 feet (762 meters) long at the head of the latter stream; thence following the western bank of a tributary of the Cañas Gordas River, and developing up the latter stream, reaches the village of Cañas Gordas, 35 miles (56 kilometers) from Antioquia, 816 miles (1,314 kilometers) from Quito. Barometrical observations by Mr. J. H. White indicate that northward from Cañas Gordas the river falls at the rate of about 2 per cent, and that thence forward, down the valley of the Sucio, no gradient exceeding 1 1/2 per cent would be necessary anywhere."

Mr. Shunk values the main line from the Poblanco to Antioquia at $24,000 per mile ($15,000 per kilometer) for grading, masonry, and briges; the extension from Antioquia

to Cañas Gordas, difficult ground, at $48,000 per mile ($30,000 per kilometer); the branch to Medellin and the branch to La Quiebra at $32,000 per mile ($20,000 per kilometer). The material to be moved is chiefly red or yellow clay, loamy or sandy to some extent, but for the most part stiff. There are exposures of slate and shale, frequently metamorphic. Here and there occur beds of pumice sand, indurated. Scattered bloks of basalt, trachyte, porphyry and granitoid rock may be said to be characteristic of the whole interandine upland explored by this party. The bowlders in the river bed are very much the same everywhere. South of the Patia Valley comparatively little clay will be met. From the point of entrance of the corps into that valley northward it is a predominant material in "excavation." Solid rock occurs so rarely and, in the absence of frost there, the material actually existing stands at so steep a pitch, that Mr. Shunk thinks the whole line might be estimated as loose rock at slopes of 1/4 to 1 @ 1/2 to 1. Nowhere was building stone seen in the bed. It is found only in the stream beds. There it abounds. Streams also abound: so that by means of steam crushers ballast might be provided quite conveniently. All through the region herein reported on there is timber for ties.

On June 7, 1892, the corps set out northward from Medellin, down the valley of Rio Porce, and followed that valley through the towns of Copacabana, Jirardat, and Barbosa to the bridge, a short distance below the mouth of the Rio Grande.

"The survey there was diverted from the inmediate valley of the Porce and, proceeding along the highway through Pabon, formerly called Hojas Anchas, across the Rio Guadalupe to Carolina, thence swung northward, again traversing the bridge north of Rio Guadalupe to the Hi-

guerón Summit, a marked depression near the junction of the Guadalupe and the Porce, 854 meters (2,800 feet) above the said junction on one hand and only 185 meters (605 feet) above the San Pablo on the other. Thence the line was continued, still following the road along the crest of the divide between the Porce and Nechi to the town of Anorí, where the corps arrived July 1, about 83 miles (133 kilometers) from Medellin."

At Anorí the corps was divided, Mr. Garrison, with section 2, traversing the highway thence through Campamento, Yarumal, Turbaco, and Raudal to Cáceres, and Mr. Shunk, with section 1, going to the same destination by way of the hamlets of El Indio, Cruces de Anorí, Zea, and Cruces de Cáceres, and the valleys of the Beguquillo, and Cauca. The corps reassembled at Cáceres July 21, section 2 some days in advance of section 1, the former having made 73 miles of survey, the latter 84.

From Cáceres Mr. Shunk had expected to be able to cross nortwestwardly to the divide betwen the San Jorge and the Sinú to a point about 20 miles (30 kilometers) southward from the Cienaga Betancí. It was learned, howeverd, that the trail in that direction did not go through, that it was in bad condition, and was, furthermore, a mere footpath, never yet passed nor made to be passed by pack animals. However, as the flatness of the country would admit a line in almost any direction, the failure to proceed as anticipated became less important. Therefore the Cauca River was descended in canoes about 30 miles (48 kilometers) to Cucharal, the port of Ayapel. Cucharal is a hamlet of one house. The animals, sent ahead light by land, were one week in making the journey. At Cucharal the corps again divided, section 1, with the surplus baggage (everything that could be spared from the field),

going down Cauca River in a canoe, and section 2, prosecuting the survey by way of Ayapel, Sahagun, Corozal, San Juan, and Turbaco to the Plaza of the Patriots, in Cartagena, 208 miles (334 kilometers) from Cucharal. Section 1 arrived in Cartagena August 7, section 2 August 26, 1892.

"From Medellin to the neighborhood of the Guadalupe-Porce junction work will be comparatively light, the lower portion of the valley, north of Barbosa, somewhat more difficult than the upper. On the whole, Juniata Valley work. The section of the line ascending from Porce Valley, crossing the Guadalupe and tunneling Higuerón Summit, is exceedingly rough ground. The Guadalupe viaduct would be about 250 feet (76 meters) high and 1,200 feet (366 meters) long. Higuerón Tunnel is proposed to be 2,000 feet (604 meters) long, at an elevation of 4,625 feet (1,410 meters) above sea, 475 feet (145 meters) below the summit, 2,325 feet (709 meters) above the Guadalupe-Porce junction, and 130 feet (40 meters) above San Pablo at its western portal. The elevation of Higuerón Summit is 5,100 feet (1,555 meters) above the sea. A gradient of 2 per cent has been assumed on the approach from the Porce, in order to cross the Guadalupe above the "Sálto" (falls) and to provide for future betterments of line without exceeding the maximum gradient used elsewhere. From Higueron Tunnel the location would follow San Pablo Valley to the Nechi and descend along the latter stream to the vicinity of the Medio Luna, thence devoloping up the Quebrada Dorada to the divide (3,050 feet, 930 meters), sloping northward to the waters of Río Neri, whence á descend is made to the proposed crossing of Cauca River. about 5 miles (8 kilometers) south of Cáceres. The work on this section is not excessive. Mr. Garrison reports it to be on the whole an easy country, presenting

no epecial difficulties, "merely a question of fitting the line to the ground and adjusting it to the topography of the streams".

From Medellin to the Cauca, near Cáceres, the rock formation is gold bearing, Antioquia being preëminently at present the gold-bearing State of the Colombian Union. Excavation would be mainly variegated clays, shales, slates, and schists, more or less metamorphic".

Is is to be observed that neither of the lines on the reach between the Río Grande and the Cauca, near Cáceres, lies near the prospective location, though occasional views of that prospective ground, from overlooking heights, were obtained by the surveyors. The line traced by Mr. Shunk noth of Anorí was designed as a reserve against a contingency of defeat on the western line. Maps being very imperfect, and his information leading him to fear a prohibitory summit in the cordillera along Cauca River, he thought it prudent to examine the Quebrada Cruces de Cáceres, with a view, if necessary, to exit that way from the valley of the Nechi. Mr. Garrison's happy discovery of the summit at the head of Quebrada Dorada superseded Mr. Shunk's individual work and is unquestionably, so far as can be judged at present, the proper ground for a railroad from Medellin to Cáceres. A partial alternative might deviate from the junction of the San Pablo and Yuyumal, which form the Nechi, to Anori, and thence, descending toward the village of Tamí, connect with the proposed location part way up Quebrada Dorada. Mr. Shunk is of the opinion that an alternative is feasible from the same point of departure as the foregoing, by way of the Quebradas, Yarumal, and Oro, and thence down the eastern flank of Cauca Valley, through Raudal, to Cauca crossing.

" Objections to this line are the height of summit west of Yarumal, 7,500 feet (2,280 meters) above the sea, and a greater length of 20 miles (32 kilometers) as compared with the proposed location. The crossing of the Cauca River south of Cáceres would approximate 700 feet (213 meters) in length; the banks firm, east side bluff, west side flat for a short distance; depth of water at ordinary stage, 8 to 10 feet (3 meters), with a flood range making it 12 feet (4 meters) deeper at high water. Bottom, shingle. Piers to be founded like those in the Allegheny, at Pittsburg. No crossing of the Cauca equal to this or at all comparable with it anywhere downstream was seen. Below Cáceres the river soon enters flat ground and laces the adjacent country with bayous. "

Mr. Shunk's line from Anorí, by way of Cruces de Cáceres, calls for no particular remark, being about 25 miles (40 kilometers) longer than the proposed location. The summit near Tamaná mines, 2,300 feet (701 meters), is considerably lower than that at the head of La Dorada, 3,050 feet (930 meters); but in every other respect the line is at a disadvantage. From the Cauca crossing no material obstacle exists to a line northwestward to the upland between the Rivers San Jorge and Sinú, whence, trending northeastward, it merges in a surveyed line north of Ayapel and follows that survey, with occasional slight deviations, to Cartagena. After passing Ayapel, the country is rolling prairie and timber, better populated and better utilized than any region of like extend seen by Mr. Shunk in South America. It is a very rich farming and cattle district. The only high ground met was the "Paloma" ridge, rising about 1,000 feet (300 meters) above tidé between San Juan and Cayetano; but it would be taken on the slant, with good approach spurs both sides, and yet at moderate cost. The general elevation of the plane north of Ayapel is 120 to 150 meters (400 to

500 feet above tide. It ascends northweswardly and culminates in the Paloma. The approximate cost of grading, masonry, and bridges from Medellin to Cartagena is estimate as follows :

24.85 miles from Medellin to Barbosa, 40 kilometers, at $ 12,000	$	480,000
38.52 miles from Barbosa to foot of Higuerón-tunnel gradient, 62 kilometers, at $ 15,000	"	930,000
13.67 miles from foot of tunnel gradient to western portal, 22 kilometers, at $ 45,000	"	990,000
55.92 miles from Higuerón tunnel to and across Cauca River south of Cáceres, 90 kilometers, at $ 15,000	"	1,350,000
239.86 miles from Cauca crossing to Cartagena, 386 kilometers, at $ 12,000	"	4,632,000
Approximate cost	$	8,382,000

Average, $ 22,500 per mile; $ 14,000 per kilometer.

The railroads now bulding would reduce the length of line to be built 30 miles (48 kilometers) from Medellin northward, and 25 (40 kilometers) from Cartagena southward. Timber for ties, stone for masonry, and water will be found on the line or near by throughout its length. From the San Jorge crossing, 25 miles (40 kilometers) northwest of Cáceres, a line about 75 miles (120 kilometers) in length is believed, from trustworthy information, to be feasible over the low western ridge to Pavarandocito on the Sucio.

Maps of the line from Quito to Medellin have already been received and are on file in the central office in Washington.

Owing to the unsuitanbleness of the season at the time of Mr. Shunk's arrival in the lower Cauca Valley, it was not advisable to attempt a survey of the Isthmus of Panama at that date, consequently he has been transferred from Cartagena to San José de Costa Rica, with orders to begin a line at some suitable point in that neighborhood

and work southward towar Panamá, reaching the insthmus in February, a favorable season for operations in that unhealty region, and make connetion with the northwestern terminus of his line in Colombia at Cañas Gordas. He sailed from Cartagena on the 16th of September and reached the capital of Costa Rica the 26th of th same month.

SOUTH AMERICA.

CORPS N.º 3.

J. IMBRIE MILLER, *Engineer in Charge*.
W. D. KELLEY, *Assistant Engineer*.
J. R. KURTZ, *Assistant Engineer*.
WINTER L. WILSON, *Topographer*.
ALGERNON B. ALDERSON, *Draftsman*.
J. DOUGLAS FORSTER, *Junior Assistant*.
CHARLES W. RUSH, *U. S. Navy, Surgeon*.

This party was assigned the survey of the line from Quito southward through Ecuador and Perú to Cuzco, the ancient capital of the latter country.

The engineers sailed on April 10, 1891, from New York, with those of the second corps; but as Mr. Miller had been instructed to proceed in advance to Perú, to gather information regarding the route, he turned over his party to the engineer in charge of corps No. 2, and sailed direct to Callao, arriving April 27.

He reports having been courteously received and handsomely entertained by the United States minister to Perú, Mr. John Hicks; by the secretary to the United States legation, Mr. Richard R. Neill; by Admiral Brown and officers of the flagship "San Francisco", and by private residents of the capital.

Attaché Ensign W. E. Safford, U. S. Navy, on special duty in Perú in connection with the Columbian Exposition, kindly acted as interpreter.

Interviews were secured with Gen. Remigio Morales Bermudez, the President of the Republic, and with the secretaries and other Government officials thought to be most able to forward the interests of the Commission. Letters of introduction from Mr. Leffert L. Buck, the commissioner from Perú, to El Señor Don Ernesto Malinowsky, Mr. Eward Thornton, and other distinguished civil engineers procured much useful information. Through El Señor Malinowski permission was accorded to visit the Geographical Society of Lima and trace portions of Raimundi's new map of Perú. Copies of the text of this important work were presented.

May 6, nine days after landing, the engineer started for Guayaquil, arriving there May 10, and at Quito May 20.

El Señor J. M. P. Caamaño, governor of the Province of Guayas, furnished transportation, as had already been done for the double engineer corps with Mr. Shunk. On arrival at camp. 3 miles north of Quito, the supplies were inspected and repacked, instruments adjusted, riding horses and pack mules purchased, and a few natives exercised in field duties, so that on June 1 the third corps camp was moved 12 miles south of Quito.

The next day both the second and third corps commenced work on the railroad survey at Quito, the third corps working southward, taking a belt contour-line topography from 3 to 5 miles in width, including all available ground for railroad location on the Quito route, and also connecting with the main valley route eastward of Quito, surveyed by Mr. Shunk.

From June 2 to October 31 (five months) the corps completed 507 miles of careful instrumental surveys, equal to a little more than 100 miles per month, of which 80 miles per month were on the main route south of Quito.

The compass and barometer were only used as checks

on the instrumental alignment and levels, the measurements being taken with the stadia, the ground being too broken for accurate use of chain or odometer.

On October 31 the survey reached a point 60 miles south of Loja, in Ecuador, near the border of Perú, and 415 miles from Quito by may survey.

Some of the principal points on the location are noted below, with the distances from Quito, the altitudes above ocean level, and their respective populations.

PLACE.	From Quito.	Altitude.	Population.
	Miles.	Feet.	
Quito	..	9,350	80,000
Zero Monument	1	9,325	..
Santa Rosa Summit	10½	9,986	..
Amaguana Bridge	11	8,470	2,000
Uyumbicho	12	8,850	2,000
Tambillo	14	9,250	3,000
Machachi	22	9,760	8,000
Tiopullo Summit	34	11,540	..
Latacunga	57½	9,177	15,000
San Miguel	65½	8,786	3,000
Ambato	81	8,304	18,000
Mocha	95½	10,810	3,000
Chimborazo Summit	102	12,000	..
Chuquipogio	106	11,716	..
Cajabamba	120½	10,715	4,000
Sicalpa	121	10,631	4,000
Columbe	134½	10,454	1,000
Guamoto	138	10,080	8,000
Palmira	148	11,650	1,000
Tigsan	155½	9,784	1,500
Alausi	161	7,857	3,000
Chunchi	172⅓	7,632	2,500
Azuay Summit	197	11,160	..
Tambo	203½	9,990	1,000
Cañar	205	10,368	5,000
Curiquinga Summit	213¾	10,888	..
Biblian	227¼	8,840	3,000
Azogues	231	8,494	6,000
Chuquipata	234½	8,100	200
Cuenca	247	8,600	40,000

From Quito to Loja the survey follows the valley of the Andes between the Maritime and Central Cordillera. This valley is crossed by numerous mountain spurs, each of which divides the drainage (as at Tiopullo, Azuay, etc.), and the engineering problem is to cross these summits with suitable gradients and alignment, and at the same time avoid as much as possible the numerous deep ravines along the mountain slopes.

The line from Quito to Cuenca presents no extraordinary engineering features excepting high viaducts and somewhat of a lack of good building materials adjacent to the work.

South of Cuenca the ground is very broken and in places covered with dense forests, the cross ridges being frequent and irregular.

Both at Cuenca and Loja and elsehewre the Government officials and private citizens were very prominent in showing attention to the officers of the Commission, and the leading ladies made silk American flags to grace the banquet tendered the engineers.

To El Señor Antonio Borero, governor of the Province of Cuenca, and El Señor Ulpiano Valdivieso, governor of the Province of Loja, grateful mention is due. The latter was good enough to cash bank drafts on Guayaquil, so as to save delay in carriage of specie required.

The weather proved wet and cold at the high altitude selected, and there was considerable sickness caused by exposure. Mr. Miller, the chief of the party, was, soon after his arrival at Quito, attacked by a malady to which persons unaccustomed to these high altitudes are somewhat subject, and, although warned by the surgeon of the party and by resident physicians that he ran great risk by remaining in the country, he refused to return home until after two relapses, when he was so much reduced in strength that

he had to be carried to the coast in a litter. Great credit is due Mr. Miller for the very satisfactory work and good progress of his party, as well as for his pluck in remaining so long at the serious risk of his life.

Mr. William B. Sorsby, United States consul-general for Ecuador, and Mr. Martin Reinberg, the vice-consul, were very attentive to the interests of the Commission.

Upon his return to the United States Mr. Miller submitted the following:

Estimate of cost of railway, Quito to Cuenca.

[271.7 miles single track (main and side tracks), main track 247 miles.]

		Gold values.
Excavations and tunnels	$	5,203,461.35
Masonry and riprap	"	1,295,576 00
Iron viaducts and girders	"	2,392,040.00
Fencing, guards, road crossings, etc.	"	248,500.00
Land damages	"	150,000.00
Engineering, legal expenses, and incidentals, .05	"	464,478.86
Total	$	9,754,056.11
Cost of roadway only. . . . .per mile.	"	35,900.10
Track and ballast	$	2,037,750.00
Telegraph	"	98,800.00
Passenger, freight, and water stations	"	322,900.00
Engine houses and repair shops	"	175,000 00
Total	$	12,388,506.11
Total cost without rolling stock. .per mile.	"	45,596.83

The prices upon which the estimate is based are as follows:

Earthwork. . . . . .per cubic yard.	$	0.25
Solid rock. . . . . do . .	"	1.25
Tunnels. . . . . .per running foot.	"	75.00
Riprap . . . . . .per cubic yard.	"	2.00
Arch culverts. . . . . do . . .	"	10.00
Iron work erected . . . . . per pound.	"	07 1/2

Track and ballast complete	.per mile.	$ 7,500.00
Loose rock.	.per cubic yard.	" 75
Foundations	do . . .	" 50
Box culverts	do . . .	" 6.00
Abutments.	do . . .	" 8.00

Upon the departure of Mr. Miller from Ecuador, Mr. W. D. Kelley was placed in charge of the corps and successfully conducted the survey, under trying circumstances, to Cuzco.

Messrs. Kelley, Wilson, and Forster, constituting the field force, left Loja on the 19th of October, 1891, and reached the Peruvian line on the 26th of November, covering á distance of 72 miles. At Loja it became necessary to reorganize the camp, purchase fresh mules, and hire new men, The first hired by public advertisement became frightened at the prospect ahead, and refuced to enter the mountains through fear of the Indians and the wild beasts. Requisition was accordingly made upon the governor for the usual forced "peon" labor for linemen and mule drivers, the former being paid by contract to move the main camp, consisting of Messrs. Kurtz, Alderson, Rush, and Bosanquet, who had in charge the necessary provisions to carry the party through the unpopulated section between Loja and the first considerable towns in Peru. The help thus obtained moved the main camp a distance of ten leagues on the 2d, 3d, and 4th of November, but on the night of the latter date the natives escaped from camp and ran away. Requisition was again made upon the gorverıor for more men and the necessary guard of soldiers. The men could not be obtained, but 12 soldiers under a captain were by permission of the Ecuadorian Government procured. These soldiers moved the camp, under charge of Mr. Kurtz, á further dintance of 2 ½ leagues to a summit of the cordillera called Savanilla-

It was now the 20th of November, the members of the camp being disheartened, and, after holding a meeting in the rain, decided to return to Loja, thus leaving the advance party without proper provisions. Mr. Kustz, being too ill with rheumatism to continue on, remained, at Loja some time and finally returned to the United States, having been actually employed in the fieldd less than three weeks. Mr. Bosanquet, however. makes a trip on foot through the forests and reports to Mr. Kelley the condition of affairs. Bosanquet is then placed in obsolute charge of the main camp, and receives orders to return to Loja. reorganize, and conduct the main camp by another route until he overtakes the survey camp under Mr. Kelley, which was successfully accomplished, the reunion taking place at Bajabamba, Peru, February 5, 1892, Mr. Alderson and Dr. Ruhs accompanying Mr. Bosanquet. The action of Mr. Bosanquet in making a trip on foot through this wild region, leadin á mule packed with provisions for the three sorveyors in advance hidden in the depths of the forest, was highly commendable, and probably prevented an unfortunate delay in the prosecution of the enterprise if not the loss of life.

From Loja soutward the line as surveyed has a gradual ascent for 7 miles to the summit of Cajanuma, 8,302 feet, in a flat open country, thence to a summit of the cordillera, elevation 6,350 feet, 35 miles distant from Loja by a meandering line along the mountain side, the small villages of Vilcabamba and Yangana lying to the westward below After crossing over to the headwaters of the Amazon, the line runs through a very mountainous region covered with dence forests as far as the Rio Canchis, only an occacional Indian hut being encountered, the section almost destitute of food and resources, the canned supplies brought

from the United States having been the main dependence. The mountain streams carry some gold, and signs of other metals are apparent, but owing to the remoteness of the locality and it inaccessibility, it would not be profitable to work mines in this section at present. At this time very long stadia sights and barometer checks had to be resorted to in order to make sufficient headway to prevent being inclosed between the swollen mountain torrents, for the rainy season was on in full force and the region was devoid of food supplies. The presipitous mountains and the dence forests requiring much chopping, all tended to delay the wokr, but by clearing the hilltops, stripping the trees of bark, erecting cross-arms thereon and utilizing them as stadia rods, maximum sights of about six miles were obtained and the necesary rate of progress secured. The Indian help was short; many had the fever, much of the work being in the rain and mud. Both men and animals became greatly fatigued, and the latter having no feed except vines, all exercised an unfavorable influence upon the speed af the work,

Mention is due of the kindness of Dr. Castillo, dean of the cathedral of Loja, for the supplies he personally the furnished for is orders to the Indian communities to supply provisions to the surveying party and feed for their animals.

The next reach in the survey is that extending from the northern boundary of Perú to Cajamarca, a distance of 191 miles. From the frontier soutward the same mountainous country continues for about 50 miles, when the flat bottom lands of the valley of the Marañón are encountered at an elevation above sea level of 3,000 feet. These are low, hot, and sandy, the trees of tre forest being replaced by a low, hardy growth of thorny bushes, with woods in

patches. In this section numerous insects are found, while the climate is unhealthy. The line was run so as to skirt along the edges of the foothills, through the old town of Jaen, and reached the Marañón River at a point 76 miles from the Ecuadorian frontier and 12 miles south of Jaen, at an elevation of 2,550 feet, thence following the western bank of the river, in and upstream direction, a distance of 20 miles to an elevation of 2,957 feet, when such abrupt projecting spurs, 4,000 feet in height, alternating with deep-cut cross gorges at right angles to the line, were encountered that it became impracticable to adhere to the valley any longer, and the survey or were forced to carry the line to the right and up on the table-lands. At the point where the valley was left the character of the ground was barren sand and rocks, the region was without population, without mule trails, and without provisions for man or beast.

The survey of the Marañón Valley can best be accomplished by starting at the head waters near Cerro de Pasco and descending the stream.

By ascending to the plateaus, as indicated above, the preliminary line traversed the richest mineral an agricultural sections of the interior of Perú all the way to Cuzco and passed through the principal towns and capitals whereas, had the conditions along the Marañón been favorable to the prosecution of the survey in an upstream direction, as was originally intended by the Commission, the line would have been run, it appears, through a region without population and without present resources. It is desirable that the alternative elevated line from Loja, Ecuador, to the neighborhood of Chota, Perú, should be surveyed in the near future. Owing to the small size of the field party, three engineers and a few Indian helpers,

and the scanty supply of the plainest food, it was not practicable for Mr. Kelley to make other route inspections while pushing his line over the best route that the limited information obtainable indicated. Cajamarca, the capital of the department of the same name, was safely reached on the 15th of January, 1892, and ten days were then devoted to recuperating the worn-out mules, making records, and developing certain sections. As this town, the Prefecto, El Señor Dn. M. C. Vargas, hospitably entertained the engineers at the prefectura for ten days, cared for and fed the mules, all without charge. A banquet was given the engineers and other evidences of the friendly feelings entertained by the Peruvians towards the commendable scheme of an intercontinental railway were exhibited.

The line from the Ecuadorian frontier to Cajamarca, with the exception of about 30 miles through the bottom lands of the Marañon, would be expensive and would require maximum gradients and curvatures, but when the final location is made it is believed that the elevated alternative between Loja and Cajamarca would be the one adopted. Along the southern end of this line there are several considerable towns. Near Buena Vista and Jaen coffee, tobacco, and cocoa are grown in limited quantities, and much more could readily be produced, but in the absence of means of transportation to the outside world there is no incentive for such extension. Near Cajamarca there are extensively worked silver mines, bituminous coal fields of good quality and ample quantity, together with productive agricultural lands. At this point the Marañón River lies about 40 miles to the eastward.

The next reach of the survey is that extending from Cajamarca to Huaraz, a distance of 225 miles as measured

on the preliminary line. The engineers left Cajamarca January 25 and reached Huaraz March 12, 1892. From near the former town the line descends through a broad, open valley to a junction with the Rio Huamachuco for a distance of about 35 miles to an elevation of 7,500 feet (the Marañon being 15 miles eastward), thence ascends the former stream to its source and to the top of the main cordillera of the Andes, at which point a spur of somew hat higher elevation and with snow capped peaks runs eastwardly to the Marañón. Here two alternatives presented themselves, the eastern one on the Marañón slope of the main cordillera and the western one on the Pacific slope. The former would require tunneling through the numerous spurs and cross at right angles the deep gorges and waterways leading to the Marañón for a distance of nearly 150 miles, and would traverse a country very rough, but little populated and of meager natural resources. The latter crosses the main cordillera on the surface at an elevation of 13,026 feet and after a distance of 90 miles enters the beautiful valley of the Río Santa, also called the "Callejón de Huailas" thus enabling the line to be carried in its true southerly direction by easy grades up this valley, which is by far the most fertile portion of Perú, with its large towns, tickly populated roadsides, rich mineral lands both east and west, gold and silver predominating. These mines are worked on a large scale, as easy communication with the coast permitted the introduction of heavy machinery and supplanted the handling of the ores by the primitive methods of manual labor formerly in vogue.

Lower down in the same valley is the sugar cane, while to the eastward, in an almost continuous line, rise the snow-capped summits of the Andes, thus affording within

a few hours, journey all degrees of climate, temperature, and vegetation. wor the above reasons, the latter route was the one selected by Hr. Kelley, and in his opinion has proven the better. The gold districts of Pallasca and Cabana, the richest in Perú, are on the iumediate line of the survey, aud when the construction of the road is once commenced, the nearness to the coast and the facilities for getting machinery and suplies would lessen the cost of building. Moreover, the Chimbote railroad, which was destroyed by washouts, is likelyto be rebuilt in the near future, and this, with the local traffic here existing, in irself remunerative, all confirm the advantages of the Pacific to the Marañón slope of the Andes.

The surveyors arrived at Cajabamba, 60 miles south of Cajamarca, on the 3d of February and were met there on the 5th by the supply camp from Loja under Messrs. Bosanquet, Alderson, and Rush. This latter party, being under mule hire to Caraz, 125 miles farther, continued the direct line of march to the latter place, which was reached February 21, intending to await the arrival of the surveying party at that point and utilize the time in drafting the maps then in arrears. On the arrival of Mr. Kelly's section at Caraz, March 4, he found the other party al sick, Mr. Alderson being in bed with a high fever and not in condition to be moved. while Dr. Rush and Mr. Bosanquet were also ill. Under these circumstances it was impossible for Mr. Bosanquet's party to continue the march to Cerro de Pasco and accordingly as soon as Mr. Alderson could be moved he was carried to the coast, and he with Dr. Rush returned, via Lima, to the United States, where they arrived in April, 1892. Under orders from the Commission, Mr. Bosanquet's party was disbanded at Lima, and he in person proceeded to join Mr. Kelley in the field at Huancayo, where he arrived May 10, 1892.

The unfortunate illness of Messrs. Kurtz, Alderson, and Rush and the Savanilla mishap, all show the difficulties under which the survey was prosecuted to a successful end by the unswerving determination ad skillfull management of Mr. Kelley, ably seconded by Messrs. Wilson and Forster, who remained with him to the end.

The next stretch of survey to be considered is that from Huaraz to Cerro de Pasco, a distance of 144 miles as measured along the preliminary line actually run. Leaving Huaraz March 16, Cerro de Pasco was reached Aprile 6, 1892. From the former town southward the line ascends by easy gradients and cheap construction á distance of 16 miles along the Rio Santa to the town of Recauy, situated at the head of the industries of the valley and the populous district and where are located extensive silver smelting works.

At Recauy two alternatives present themselves; but, owing to the reduced size of the surveying corps, only one could be examined: First, an eastward line requiring a triple crossing of the cordillerra via Huallanca and, the Marañón slope of main chain to Cerro de Pasco. Secondly, a westward line on the Pacific slope, passing bi Cajatambo and crossing a high spur of the cordillera forming one of the above-mentioned triple crossings. The former route passes through the large coal and silver mining districts of Huallanca and enters the populous deparment of Huanuco which is very fertile and productive. The latter crosses, aspur with as high a summit as that of the main ridge,but without the coal and silver industries and population to recommend it, and besides would require a steeper and more troublesome ascent in order to attain the high pampa of Cerro de Pasco. Under these circumstances the first alternative was selected and is believed by Mr. Kelley to

be the better route, although before final location the other should be surveyed. Near Recuay the main cordillera is crossed at an elevation of 14,927 feet and the two spurs can be crossed on the surface by developing the line along the rocky and snowy mountain sides, at elevations of 15,199 and 15,128 feet, but it is believed that tunnels here would be preferable.

Thence descent is made by a rather narrow valley to Huallanca, where coal is abundant in quantity and is of good quality, while the silver ores pay as high as $320 per ton, those as low as $37 per ton being cast on the dump. Smelting works with improved machinery are being established. At this point hospitalities were extended to the engineers, while the prefect and certain citizens of Huanuco, 32 leagues distant, came to pay their respect to the representatives of the Commission. From Huallanca to Cerro de Pasco, 84 miles, owing to the crossing at right angles of the numerous gorges of the headwaters of the Marañón, the line would be costly, except the last 15 miles at the Cerro de Pasco end. This latter town is famous for its silver mines, its business industries, and extensive commerce, and for the number of foreigners to be found there. Within a radius of 12 miles the country is dotted with small mining towns and haciendas for working silver. There is a railroad 3 leagues long from the mines in Cerro de Pasco to the reduction works. The mines are mostly under the city, and in addition to the railroad thousands of llamas are used to transport the ore.

The city as han elevation of 14,293 feet and consequently no timber exists in its immediate vicinity, but barley straw grows in scattered patches, but never produces grain. The llamas graze off the very short pampa pasturage while mule feet has to be brought from a distance. Coal,

brought some 10 leagues, is used by the smelting works, the railroad, and the richer families, but the fuel most in use is the llama dung, gathered in bags by the Indian women. A sun-dried sod, called "champa", is also used for the same purpose. A banquet under the auspices of El Señor Chavez, acting Prefecto of the Department of Junin, was tendered the engineers at this point, while El Señor Valdasola, Unitd States vice-consul, showed many attentions. Here telegraphic instructions were received from the central office in Washington to continue the survey to Cuzco.

After reorganizing his party, Mr. Kelley left Cerro de Pasco on the 18th of April and reached Huancayo, 140 miles distant, May 10. From Cerro de Pasco southward the route lies across the high pampa at elevations varying from 13,400 to 14,000 feet above sea level, and passes by the eastern side of Lake Junin. So far as the topography of the country is concerned, this is the cheapest portion of the line to be constructed, the grades being easy, no heavy crossings required, and a good alignment attainable. However, wooden cross-ties in Cerro de Pasco cost $ 1.25 each, in native money, and prices of all classes of commodities are very high. After leaving Junin the line passes over a slight summit (13,751 feet) and then descends by a tributary into the Río Oroya Valley to the town of the same name. The route followed is practically that of the Oroya and Cerro de Pasco Railroad, and on April 28 Mr. Kelley's party were in camp with the engineers of that road and exchanged elevations with them. Oroya is 137 miles from Lima, and the railroad is already built from the latter place to Casapalca, which is 41 $^1/_2$ miles from Oroya, this latter distance being covered by mule traffic in one and a half days. This interval is

now under construction, and it is expected that the road will be open to the public by the 1st. of January, 1893. From Oroya to Huancayo, 68 miles, the line surveyed follows down the Oroya River, encountering no difficulties, and for the last 28, or from Jauja to Huancayo, passes through an open country, rich agriculturally, but without mineral wealth, at elevations varying from 9,000 to 10,000 feet. This section is claimed to be adapted to tea culture although none is grown there now. It contains many large towns, and the construction, of a railroad would develop a considerable passenger and local freight traffic.

After enjoying a banquet, the surveyors left Huancayo May 23 and reached Ayacucho, 117 miles distant, June 1. From Huancayo southward the survey continues down the Oroya River a distance of 47 miles to Izcuchaca, at an elevation of 9,413 feet. At this point two routes became available; the first continues down the Oroya River to its junction with the Río Huanta, and then ascends that stream to Ayacucho. The second adheres to the highlands in a generally straight direction. The first having been surveyed by other parties, although it may be the better of the two, Mr. Kelley decided to follow the second, so as not to duplicate the surveys, but obtain additional data. The line as actually run passes some towns and is not far from the rich quicksilver mines of Huancavelica, which lie to the westward of the best direction. The section under consideration is but slightly productive, is without timber, without mines, and but sparely populated by poor Indians. The first route indicated above would pass through a timbered country and through lower levels into or near the sugar, coffee, and tobacco district below Huanta. Special mention should be made of the kindness of the prefecto. El Señor Leonardo Cavero, and other officials at Ayacucho, and of the banquet tendered the members of Mr. Kelley's party.

From Ayacucho to Abancay is 137 miles. The former town was left June 6 and the latter reached July 8, 1892. The survey gradually ascends from an elevation of 8,900 feet at Ayacucho to that of 14,062, where it crosses a ridge 38 miles from the starting point, and thence descends to an elevation of 7,040 at the Río Pampas by a side hill grade line 44 miles long. The Río Pampas was crossed on rafts June 18, and the work continued, the line ascending the valley of the Rio Huancaray by an easy grade to a summit of the main cordillera having an elevation of 14,628 feet. This ridge here runs east and west, the town of Andahuailas being situated on the other side of the ridge at a distance of five leagues to the eastward. From the summit just mentioned the line then descends by the use of much curvature to an elevation of 5,800 feet in the valley of the Rio Pachachaca, lying at right angles to the line of survey. After crossing this stream there is another ascent up the valley of the Abancay to the village of that name, the route passing through the large sugar estates of Dr. Letona. In the section between Ayacucho and Abancay small villages and a sparse Incian population are found. The country, being generally high, is adapted to sheep raising, and although minerals are said to exist, no mines had been opened along therout. Owing to the crossing of the rivers Pampas and Pachachaca, the transversal ridges, and the main cordillera, the construction of this portion of the Intercontinental Railway would be expensive.

As portion of the route was believed to be infested by hostile Indians, a cavalry escort for a distance of 40 miles and arms and ammunition were furnished the engineers by the Government authorities at Ayacucho.

As elsewhere, courteous attentions were shown the Commission's representatives. Dr. Letona entertained them

for several days, and provided feed for the animals free of charge. The prefecto of Abancay. El Señor Juan Pablo Palosminos, was equally attentive, and a banquet was one of the hospitalites extended here.

The next reach of the survey, 69 miles, is that from Abancay to Cuzco, where the instrumental work ceased. The former town was left July 11, and the ancient capital of the Incas reached July 20, 1892.

Leaving Abancay, the line ascends to a summit elevation of 12,900 feet, and thence descends to that of 6,083 in the valley of the Apurimac, through a populous district, fine agriculturally, and producing considerable quantities of sugar cane. Crossing the river, there is another ascent to a summit of 12,438 feet, thence by a light gradient a descent by hillside work into the valley at Cuzco, 11,103 feet above sea level. Before final location a survey of the valleys of the rivers Pampas and Apurimac in a down stream direction towards the eastward and northward would seen to be advisable as well as the examination of an alternative line from the 12,900 foot summit south of Abancay to some point on the existing railroad between Marangani and Santa Rosa, thus adhering to the table lands and avoiding the deep crossing of the Apurimac.

A three day's mule ride of 75 miles brought the engineers to Secuani, the present terminus of the Arequipa, Puno and Cuzco Railroad. Secuani is 111 miles from Puno, on Lake Titicaca, situated upon the western boundary of Bolivia. Cuzco is 453 miles from Mollendo on the seacast, of which distance 378 miles are in operation. It is therefore apparent that by carrying the instrumental survey to Cuzco it has practically been carriel to the frontier of Bolivia.

Owing to the kindness of Mr. McCord, the entire party and baggage were passed to the seacoast, and an excursion

to Puno afforded an opportunity to inspect the whole line. Arequipa was reached July 28, and the usual courtesies and banquet extended by the prefecto, el Señor Abrill. At this point, Mr. Kelley was met by Dr. Parro, director-general of public works of Perú.

Arriving at Lima August 2, the engineers were taken ashore in a special launch and met by officials of the Government. A private reception was held by Dr. Parro at his residence, a banquet by the president of the cabinet, ei Señor Carlos M. Elias, in the exposition building, and an official presentation to the President of the Republic and his cabinet took place, all in honor of the Commission's representatives. Courtesies were also shown by Mr. R. R. Neill and others of the United States legation; dy Mr. Helcombe, of the banking firm of Grace Bros. & Co. and by Chief Engineer Thorndike, of the Oroya Railroad, who provided and excursion over his line in a special observation car. Leaving Lima August 6, the party arrived in Washingion on the 30th of same month, since which time they have been engaged in working up the data collected and in preparation of the finished maps.

Some of the principal points on the line surveyed, their altitudes above sea level, and approximate population.

LOCALITY.	DISTANCES. *	ELEVATION.	POPULATION.
South of Quito.	*Miles.*	*Feet.*	
Quito (plaza)	—	9.350	80.000
Cuenca (1)	228.3	8.600	40.000
Zaraguro	309.8	8 456	5.000
Loja	341.0	7.138	18.000
Vilcabamba	361.5	5.476	600
Yangana	369.8	6.273	200
Río Canchis (2)	413.1	3.000	—
South of Río Canchis.			
Jaen	64.3	3.389	300
Río Marañón (at first point touched)	76.3	2.550	—
Río Marañón (at point of leaving)	96.9	2.957	—
Chota	143.0	10.000	7.000
Cajamarca	191.2	9.843	30.000
Cajabamba	250.6	9.374	15.000
Huamachuco	266.1	11.035	15.000
Summit of cordillera	283.8	13 026	—
Río Mollepata	303.1	7.936	—
Pallasca	306.9	10.350	6.000
Summit of spur of cordillera	327.7	14.179	—
Corongo	338.3	9.908	7.000
Río Santa	352.1	3 952	—
Caraz	376.8	7.174	15.000
Huaraz	416.0	9.537	25.000
Recuay	431.7	10.615	6.000
Huarapasca (summit of spur)	456.8	15.199	—
Yanachachas (summit of spur)	463.6	15.128	—
Summit of cordillera	464.7	14.927	—
Huallanca	476.5	11.302	4.000
Cerro de Pasco	560.4	14.293	8.000
South of Cerro de Pasco.			
Lago de Junin	33.7	13.422	—
Oroya	72.2	12.166	300
Jauja	112.6	11.145	12.000
Other towns	—	—	50.000
Huancayo	140.3	10.635	20.000
Río Huancayo (at Izcuchaca River)	187.3	9.413	—
Summit of spur	197.8	14.723	—
Ayacucho	256.9	8.900	40.000
Summit of spur	294 6	14 062	—
Río Pampas (at crossing)	321.9	7.040	—

* Distances measured on the preliminary line.
(1) Cuenca is 247 miles south of Quito on the "location".
(2) Dividing line between Ecuador and Perú.

Some of the principal points on the line surveyed, their altitudes above sea level, and approximate population.—Continued.

LOCALITY.	DISTANCES.	ELEVATION.	POPULATION.
South of Cerro de Pasco.—Continued.	*Miles.*	*Feet.*	
Huancaray	341.5	9.669	3.000
Summit of cordillera	364.8	14.628	—
Rio Pachachaca	388.8	5.800	—
Abancay	393.8	7.853	7.000
Summit ot spur	401.0	12.900	—
Rio Apurimac (at crossing)	415.7	6.083	—
Summit of spur	433.4	12.438	—
Cuzco (end of survey)	462.7	11.003	60.000

Summary of work of Corps No. 3.

	MAIN LINE.	SPUR LINES.	"A" POINTS.	TOTALS.
	Miles.	*Miles.*	*Miles.*	*Miles.*
Quito to Ecuadorian frontier	413.1	84.7	57.5	555.3
Quito to Cerro de Pasco	973.5	127.5	73.9	1.174.9
Quito to Cuzco	1.436.2	172.3	90.8	1.699.3
Total number of miles run	—	—	—	1.699.3

Population near line of survey.

Ecuador	215.500
Perú	384.600
Total	600.100

Throughout the entire distance a stadia transit and level line was run, the barometer being used simply to check up. The time employed in the field work was that from June 2, 1891, to July 20, 1892, or one year one and one-third months. The maximum elevation attained was 15,200 feet above sea-level and the minimum 2,500 feet.

The maps covering the Ecuadorian section were made in the field by the survey camp, while those relating to the Peruvian portion of the line are now being constructed in Washington. The total survey of 1,700 miles will be exhibited on about 50 maps and as many profiles. The estimate of the cost of construction of the section between Quito and Cuenca, by Mr. Miller, has already been given. Mr. Kelley submits the following approximate estimate of the whole line:

Quito to Cuenca (by Mr. Miller):	
247 miles, at $ 35,900 per mile	$ 8,867,300
Cuenca to Loja, 113 miles:	
36 miles, at $ 25.000 per mile	" 900,000
77 " at $ 55,000 " "	" 4,235,000
Loja to Peruvian boundary, 72 miles:	
5 miles, at $ 20.000 per mile.	" 100,000
67 " at $ 60,000 " "	" 4,020,000
Ecuador	$ 18,122,300
Peruvian boundary to Cajamarca, 191 miles:	
55 miles, at $ 20,000 per mile	$ 1,100,000
136 " at $ 52,000 " "	" 7,072,000
Cajamarca to Huaraz, 225 miles:	
40 miles, at $ 18,000 per mile	" 720,000
185 " at $ 50,000 " "	" 9,250,000
Huaraz to Cerro de Pasco, 144 miles:	
60 miles, at $ 20,000 per mile	" 1,200,000
84 " at $ 55,000 " "	" 4,620,000
Cerro de Pasco to Huancayo:	
140 miles, á $ 20,000 per mile	" 2,800,000
Huancayo to Ayacucho, 117 miles:	
47 miles, at $ 25,000 per mile	" 1,175,000
70 " at $ 55,000 " "	" 3,850,000
Ayacucho to Abancay, 137 miles:	
43 miles, at $ 30,000 per mile	" 1,290,000
94 " at $ 55,000 " "	" 5,170,000
Abancay to Cuzco, 69 miles:	
29 miles, at $ 25,000 per mile	" 725,000
40 " at $ 40,000 " "	" 1,600,000
Perú	$ 40,572,000

Ecuador	$ 18,122,300
Perú	" 40,572,000
Total	*$ 58,694,300

*Calculated on the mileage of the preliminary survey.

The line by location, owing to curvature in development, etc., may be longer, but the cost of construction of the Intercontinental trunk line would depend very much upon the cost of getting machinery, supplies, tools, materials, etc., into the interior. The building of the several roads now projected from the coast into the interior, as well as the utilization of those already existing, would materially lessen the outlay.

A. J. Cassatt,
Chairman Executive Committee

Washington, D. C., *January 31, 1893.*

LIST OF DELEGATES.

(Arranged alphabetically according to nations.)

President, ALEXANDER J. CASSATT.
First Vice-President, LUIS J. BLANCO.
Second Vice-President, PEDRO BETIM PAES LEME.

ARGENTINE REPUBLIC.

Carlos Agote.
Julio Krause.
Miguel Tedin.

BRAZIL.

Pedro Betim Paes Leme.
Francisco de Monlevade.
Francisco Leite Lobo Pereira.

COLOMBIA.

C. Federico Párrraga.
Julio Rengifo.
Climaco Calderón.

ECUADOR AND PERÚ.

Leffert L. Buck.

GUATEMALA.

Antonio Batres.

MÉXICO.

Leandro Fernández.

PARAGUAY.

John Stewart.

SALVADOR.

Benjamin Molina Guirola.

UNITED STATES.

Alexander J. Cassatt.
Henry G. Davis.
Richard C. Kerens.

URUGUAY.

Francisco A. Lanza.

VENEZUELA.

Luis J. Blanco.

LIST OF COMMITTEES.

AUDITING COMMITTEE.

Mr. Julio Rengifo, of Colombia.
Mr. Luis J. Blanco, of Venezuela.
Mr. Pedro Betim Paes Leme, of Brasil.

COMMITTEE ON COMMITTEES.

Mr. Henry G. Davis, of the United States
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Interoceanic railway.

CHAPTER IX.

INTEROCEANIC RAILWAY.

One of the greatest railway ideas of the age is without doubt the projected line between the ports of Recife and Valparaiso.

In the same manner that the mission of the Intercontinental line, which runs from North to South, is to effect a union between all the States comprised from Canada to Chili and the Plate, it is for the Interoceanic railway, running from East to West, to place the States of Brazil, extending from Pernambuco to Rio Grande del Sud, in communication directly with the Uruguayan and Argentine Republics and Chili, and indirectly with Paraguay, Bolivia, and Perú.

The importance of this artery which will unite the railway systems of the countries mentioned, does not only concern the Nations which it will serve, but it also affects the time now employed in communication between the the Brazilian, Plate and Pacific ports with the European continent on the one hand, and with Australia and New Zealand on the other.

The idea of an artery which will attain these ends, as regards the communications of the future has been a noble inspiration on the part of the men and governments of these countries. As far back as 1868, when the Buenos Aires

legislature were considering the project of making the surveys for the Transandine Railway, Don Pedro Agote, the Statist, read a letter addressed to himself by Dr. William Rawson, who in support of the idea to place the Plate in communication with the Pacific, said as follows:

"For the Argentine Republic, this grand project would mean the population of 4.000 leagues of desert and the formation of cities and provinces for which names have yet to be found, and which, like Illinois, Indiana, Michigan and Iowa in the West of the United States, are immensely rich, and, like the States named, would aid in supporting American democracy."

" For the Pacific republics, the Transandine Railway would establish the most solid relations of friendship and mutual convenience with this section of America, and would open up to them, also, a direct means of communication with Europe.

" For universal commerce, for the aggrandisement of of those new worlds which have arisen in the Southern seas under the names of Australia, New Zealand etc: this interoceanic railway will be indisputably the most efficient road for their gigantic development, and a thousand times preferable to all the existing routes, viz, Cape Horn, the isthmus of Panamá, the Suez canal and even the Central United States Railway which, starting from the shores of the Atlantic and traversing a distance of over three thousand miles, will, at the end of 1868, terminate at San Francisco in California.

" When we have constructed the bare two hundred leagues that separate us from Curicó, an immense revolution will have been wrought in the commercial routes of the world.

" It will then be necessary to widen the streets of Buenos

Aires, in order that they may contain the crowds of human beings of all races who, loaded with infinite varieties of wares, will seek its market, leaving among us traces of gold and light which so splendidly indicate the civilization of the age.

" Unless the prognostications of my ideas and my desires fail me, all this will be brought to pass within twenty years, and twenty years, my dear friend, are but a minute of time for towns like ours, on whose ears still resound the clamour raised by the fall of the most sanguinary and odious tyranny that modern history has known."

What Dr. Rawson foretold will come to pass; the Andes, which then raised themselves as an impassable barrier to free transit, already show openings through their midst for the passage of the means of circulation which will expand the mutual relations between the Pacific and the Plate and which will extend their influence to that other world of Australia and New Zealand, for which will be opened a new route, creating for them relations with the Plate which to day do not exist, and at the same time facilitating communications with the European Continent and Great Britain.

And if such a favourable future was projected for the line intended to connect Valparaíso with Buenos Aires, how much more so will it be when that line is extended across the republic of Uruguay and Brasil to the port of Pernambuco?

The most powerful conception is not able to embrace the transformation in the commercial destiny of those countries once the interior of their States, with all their varied animal agricultural and mining products, are put in a position to communicate with ease with the great consuming centres of the globe.

The line from Valparaiso to Buenos Aires will serve the

immediate interests of the Pacific and the Plate; but the line from Valparaiso to Buenos Aires and Pernambuco is truly an interoceanic line and will serve the most important interests of the majority of the States of South America.

It will cross 6500 kilometers of fertile lands placing in mutual communication 31.000,000 souls that at present inhabit the countries interested in its construction.

The line to Buenos Aires shortens the journey between the Pacific and the Plate and the European continent, but it does not solve the problem of rapid communication between the Plate and the interior of Brazil with the other American States, with the continent of Europe, and Great Britain, a question of the greatest importance which will be met by the proposed line from Recife to Valparaiso.

In Brazil also public opinion is fully made up as to the great significance of this line in the commercial, political and national welfare of that country, and the authorities have accordingly authorized on October 17th 1891 the construction of the line that will leave the port of Recife (Pernambuco) and will terminate in San Luis, on the frontier of Uruguay with Rio Grande del Sud, the point where the section commences that will cross Uruguay, authorized by the Assembly on September 6th 1889.

The dominant opinion in Brazil on the convenience of the construction of this railway is well demonstrated by Dr. Octacilio Camarà in his work "The strategic value of the city of Pelotas", published in Rio de Janeiro in 1891, in which he devotes the second part to point out the immense importance of this line for the interests of Brazil and of America.

Ex-senator Barros Barreto also has written a series of important articles on it which he concludes thus:

" All the energies that have been given to carrying this

" powerful element of progress to the centres of our " population and even to the most distant districts will be " unfading titles of genuine patriotism in the history " of Brazil".

" Such titles will form the crown of honour which will " be due to those Brazilian Lesseps who may carry through " the construction of the colossal work of national progress " typified in the Interoceanic Railway".

The following remarks are attributable to Don Alfred Lisboa:

" The unexpected appearance of this great project and " its publication will undoubtedly produce immense enthusiasm " amongst those who do not doubt the great future of our " country, whilst not a great number of others will be " indifferent or incredulous in view of the magnitude and " audacity of the works, perhaps astounded at the immense " capital that its realization will require".

" The editor of the " Railway Review " says:

" Unless we shortly obtain the means of locomotive " overland transit between the Atlantic and the Pacific " oceans our importance will be reduced by the isolation " in which the interior states of Brasil will continue, and " the consequent want of expansion of the elements of their " national life".

The Interoceanic line, as we have said, will leave the Port of Pernambuco (Recife), which with the proposed improvements will be made into a first class port with sufficient water for the largest ocean steamers: it will follow the valley of the River San Francisco whose banks have from the most remote times served as a means of road transit for the Brazilian interior commerce and which will thus in future be called upon to better fulfil that object by serving as a passage for the great

communicating artery which will connect all the lines running down to the banks of that great river and thus facilitate the working of their local vast riches. By means of the projected line from Araxá, Catalão and Goyay it will communicate with the future Federal Capital which the scientific commission presided over by the astronomer Dr. Gouls has decided to fix on the table land of Goyaz; it will cross the railway system of the States of Bahia, Minas Geraes, San Paulo, Paraná, and Rio Grande del Sud; running through the town of Bagé it will reach San Luis on the frontiers of the Uruguayan territory; it will then cross this latter country passing through gold, copper and coal districts via the towns of Durazno, Trinidad and Colonia; it will then cross the River Plate to Buenos Aires by means of the steam train ferries on the North American system similar to those employed on the New York and San Francisco overland line in the bay of the latter place, capable of transporting, a railway train of 48 wagons and the engine, steam-ferries that are used in that bay to run a distance of 60 kilometers from the bar of the River Sacramento to the city of San Francisco; from Buenos Aires it will continue over the Pacific and Great Western railways via San Luis and Mendoza to the terminus of Valparaiso.

The Interoceanic railway will communicate, by lines already constructed, with the towns of Natal, Alagoas, Bahia, Ouro Preto, Rio de Janeiro, San Paulo, Santos, Curytiba, Paranagná, Porto Alegre, Pelotas, Uruguayana, Salto, Paysandú, and Montevideo; with all the capitals of the Argentine Provinces to which the railway system leaving Buenos Aires extends, and with the Chilian capital of Santiago.

With the lines proposed or in course of construction it

will communicate with Asunción, the Capital of Paraguay, and with the towns of Sucre, Potosí and La Paz in Bolivia, in which country it will form a junction with the Intercontinental line.

It is well established that lines crossed by others in a perpendicular or transverse direction do not compete with them but on the contrary protect and assist them, by mutually increasing the traffic; the general plan of the direction of the Interoceanic line, as at present proposed, will benefit in a favourable sense the systems of Brazil, Uruguay, the Argentine Republic and Chile; the systems of those countries will be powerful auxiliaries in the same way as the tributaries of a great river, flowing into it from all sides bring down the commercial and industrial products of each country, and in return they will have brought to them by the same means traffic from distant lands that will be distributed through each State by the numerous local arteries.

The Interoceanic railway will not only be of utility to Southern America but it must be treated as a necessary agent, indispensable for the better opening up of its towns, for the rapid and economical establishment of communication between them, and the only means of advancing the individual and national prosperity with the rate of progress demanded.

Human existence is very limited, the active period of a man's life, in which he has to establish his position and that of his family is very brief, and has passed away almost before its presence has been appreciated, and to enable the fullest employment in that short period to be made of the energies of life is a supreme consideration only given weight to by nations of a common level.

Those countries which have been able to put together in a limited time, by individual and collective efforts, the

greatest amount of work, will be the strongest, most vigorous and most independent.

Speedy means of communication are a first necessity that cannot be overlooked by new towns without exposing themselves to delay in their development, and this great line will break through the existing isolation and facilitate intercourse between the South American States.

A few figures will demonstrate the commercial importance of the interoceanic line: they are taken from the report presented to the Brazilian Government by the Company to whom the line of which we are treating was conceded, and although they refer to the year 1889, they are not without significance.

In the year mentioned the commercial movement of Chili represented the sum of £ 51.734.859, or an average increase per annum for the five years from 1885 to 1889 of £ 3.600.000 or 8.1 %; the number of tons of cargo handled in the same year was 16.689.014 (Statement of the Chilian Republic, page 1.)

In the same year, the general commercial movement of the Argentine Republic was £ 65.404.600, being an annual average increase, for the five years from 1885 to 1889 of £ 5·564.194 or 13 %; the number of tons handled being 19.061.754 (Arg. Rep. p. 214.)

Notwithstanding the crisis of 1885-86, the import and export movement of the Uruguayan Republic amounted to £ 13.357.016, being an average yearly increase for the five years from 1885 to 1889 of £ 642.205 (Uruguay Rep. p. 177) the number of tons handled being 2.427.137.

In 1887 and 1888 the United States of Brazil had a commercial movement of £ 61.214.382 ("Le Brésil" by Alfreo Marc. vol II p. 609.)

During the three years since 1887-88, Brazil has

tremendously increased its commerce, its produce, and its income; it is sufficient to quote figures with respect to coffee, one of its principal sources of riches; in the year 1886, 3.580.965 sacks were exported from the port of Rio de Janeiro and according to all accounts no less than 8.000.000 sacks will be exported during the present year (p. 49 of the report of the Finance Minister presented in June 1891) which will be equal to more or less £ 37.000.000, and if to this be added its immense export in caoutchouc, tobacco, cocoa, sugar, cotton, cane and other produce, mineral riches and woven manufactures, according to our calculations the amount of the exportations this year cannot be less than £ 49.000.000.

For various reasons; it is said that the imports should have somewhat exceeded the exports, but, supposing they were equal, it may well be taken that the general commerce of Brazil during the present year will not be less than £ 98.000.000. We have not the exact tonnage represented by this sum, but estimating it by the figures which we possess relating to the Plate Republics and Chili, it should be about 24.000.000 tons.

It will be seen that we only have statistical information to estimate the traffic in Chili, the Argentine Republic and Uruguay during the year 1889 and it is well known that in spite of the civil war and the financial crisis, the natural resources of these countries have not suffered, indeed, on the contrary, they have increased, so that we may safely assume that the tonnage of the commercial movement here given is within the limits of reality.

This total amounts to 62.177.902 tons representing a value of £ 228.493.457.

We do not wish to detain the reader by making calculations of the possible income the Interoceanic line might enjoy,

as it will be sufficient to quote in the total the enormous tonnage moved in the countries that it will principally serve, with its direct communications with the largest producing centres, and with the railway systems of Brazil, Uruguay, the Argentine Republic and Chili, that at present consist of 79.737 kilometers whose construction is authorized; —of which 30.350 kilometers are opened to service, 7.188 in construction, 4.161 partially constructed and suspended, 12.928 surveyed and 25.110 kilometers to be surveyed. It would also communicate direct or by these auxiliaries already made with all the principal towns of this part of America; Pernambuco with 190.000 inhabitants, Bahia 200.000, Rio de Janeiro 800.000, San Paulo 100.000, Porto Alegre 60.000, Montevideo 220.000, Buenos Aires 570.000, Santiago (Chili) 270.000 and Valparaiso 130.000.

The kilometric extension of the line is as follows. Recife to San Luis on the Uruguayan frontier 4.500 kilometers (the line leaving on one side the Espinosa range and mountains del Mar, and not meeting with any large valleys or hills): San Luis to Colonia across Uruguay 582 kilometers; crossing the River Plate from Colonia to Buenos Aires 60 kilometers; Buenos Aires to the Chilian frontier 1.220 kilometers: thence to Valparaiso 191 kilometers; or a total of 6.553 kilometers.

The line in Brazil will be able to take advantage of some lines already made and others in course of construction in the region which it traverses.

These are: the Recife and Palmares; the Palmares and San Francisco; the main line of the Mogyana C°., and Itararé and Passo Fundo line.

Adopting the route of the three first in its general plan it will have the following plan:

STATES.	LOCALITIES.	KILOMETRIC EXTENSION.			
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*
Pernambuco . . .	Recife to Palmares . .	121.7			
"	Palmares to San Francisco.	146.4	220.0		
Bahia and M. Geraes	Jatobá to Araxá . . .				1875.0
"	Araxá to Uberaba. . .				180.0
San Paulo. . . .	Uberaba to Campinas. .	611.4			
"	Campinas to Itaicy . .				28.0
"	Itaicy to Itú.	25.0			
"	Itú to Boituva				50.0
"	Boituva to Tatuhy. . .	22.0			
"	Tatuhy to Itararé . . .		306.0		
Paraná and R. Grande of Sur . . .	Itararé to Passo Fundo (varying the definite surveys made for this line)[2]			840.0	
Rio Grande of Sud.	Passo Fundo to Cruz Alta				140.0
"	Cruz Alta to Sta. Maria.	160.0			
"	Sta. Maria to Cacequy .	115.0			
"	Cacequy to Bagé . . .	266.0			
"	Bagé to San Luis . . .				60.0
Uruguay of Republic	San Luis to la Colonia. .			582.0	
"	Colonia to Buenos Aires.	60.0			
Argentine Republic and Chile . . .	Buenos Aires to Valparaiso.	1411.0			
		2881.5	526.0	1322.0	2333.0

With this direction the line would be 7.172 kilometers in length; 2881 open to traffic, 526 constructing, 1322 surveyed and 2333 proyected.

According to the report presented to the Brazilian Government by the concessionaires, which we have mentioned, the line will be of 1.44 meter guage, and as its construction is with the object of serving as an artery of rapid communication of the first class, the general direction taken should be that we have above indicated in order not to augment its total length.

The Mogyana and Sorocabana lines will serve as powerful assistants in its construction with a view to establish the communication between Recife and Valparaiso in the shortest possible time. The construction should commence from Itararé in a southerly direction and from Araxá or

neighbourhood towards the North, previously connecting that point with a branch line to Uberaba; in this manner when the line reaches Cruz Alta in the South, and Palmares in the North, if the construction has been simultaneously commenced of the Uruguayan section from Colonia to San Luis, it would be possible, before the completion of the sections of 500 kilometers between Passo Fundo and San Luis, and of 800 kilometers between Araxá and Itararé, to establish communication between Valparaiso and Recife by provisionally availing of the lines of Río Grande del Sud and San Paulo.

It will be recognised that once the communication is established throughout the whole line, even though is should not be with the perfection desirable, the sections constructed will become of great value, an object to be attained for the line which by its great length will demand very heavy outlay.

Thus, in order, to establish the communication between the systems of Brazil, Uruguay, the Argentine Republic and Chili, it will be sufficient to construct 3577 kilometers of railway between the following points: from Araxá to Jatoba 1770, from Jatoba to the terminus of the Pernambuco Southern Railway 220 kiloms. from Itararé to Passo Fundo 840 kiloms. the whole length of which is very easy as the line does not cross a territory requiring any great engineering works.

In that part of the main line constructed between Buenos Aires and Mendoza it runs through flat country with very easy gradients.

From Buenos Aires to Villa Mercedes a distance of 691 kilometers there is a stretch of straight line 318 kilometers long, and there are only three sections of 2 kilometers length that have a gradient of 5 in 1.000, those of 2 and

3 per 1000 predominating. From Villa Mercedes to Mendoza the line has heavier gradients.

As far as the last named place the line is of 1.676 meters gauge but from thence on across the Andes the gauge of one meter has been adopted.

The starting point of this line known as the Transandine Railway is in Mendoza distant 173 1/2 kilometers from the Chilian frontier; the stations Compuerta, Cachenta, Guido, and Uspallata are situated in kilometers 22, 39, 65. and 93, at the respective elevations of 1.019m., 1.198m., 1.436m. and 1.719 meters above sea level. Rio Blanco station is in kil: 112 at 1.981 meters above sea level and from that station forward the rack system is employed to make the ascent and descent of the Andes touching at the Puntas Vacas, Inca bridge, and Argentine frontier stations in kil: 143, 158 and 173 1/2 at an elevation above sea level of 2.359m., 2.636m. and 3.189 meters respectively.

The works on the Chilian side are being carried out by Clark's Trasandine Railway Coy. Ld. between the Argentine frontier and Santa Rosa de los Anges, a distance of 65 kilometers of which 39 kiloms. are already constructed, and 25 kiloms. are in construction, these latter comprehending the cumbre tunnels of 11.200 meters length the boring of which has already been half completed.

In Uruguay the Interoceanic line stretches 582 kilometers from the Port of Colonia to San Luis on the frontier of the State of Rio Grande del Sud.

It has been surveyed and the technical conditions are as follows:

Minimum radius	400m.
Maximum gradient	016m.
Length of straight line	438k.736m.

Length of curved line	144k.164m.
do " level "	212k.117m.
do " line on gradient	183k.828m.
do " line on pendiente	186k.955m.
Longest stretch of straight line . . .	4k.825m.
do level " . . .	4k.210m.
do between two curves in opposite directions	114m.
do between two gradientes in opposite directions	100m.
do on heaviest gradient	1k.640m.
Length of curved line on the level . .	47k.145m.
do gradients between 0 and 11.99 %	61k.983m.
do do 11.99 % and 16 %.	35k.036m.
Earthwork ballasting per lineal meter .	6m³243.

CONSTRUCTIONS.

Distance from terminus (1)	LOCALITY.	Span.	Height above sea level.
0.000	Port of Colonia.		3m.75
2.000	Colonia station.		7 " 00
4.350	Bridge over Caballada stream . .	1 of 10m.	7 " 00
15 000	Rosario station.		54 " 35
20.190	Bridge over stream General . . .	1 of 10m.	51 " 89
41.600	Petty station		108 " 55
65.200	Manantiales station		128 " 25
88.900	Perdido station.		167 " 00
112.150	Soriano station.		156 " 75
130.700	Bridge over the stream Grande. .		89 " 50
139.250	Flores station		132 " 50
158.100	Bridge over the stream Sarandi. .	1 of 15m.	99 " 10
161 300	Trinidad station		122 " 00
172.700	Bridge over stream Porongos . .	2 of 15m.	76 " 50
185.000	Castellanos station.		126 " 00
199.700	Bridge over stream Maciel . . .	5 of 15m.	69 " 50
209 800	Durazno station		75 " 00

(1) Kil 0 of the line is the mole to be constructed by the Company at Colonia.

Distance from terminus	LOCALITY.	Span.	Height above sea level.
212.300	Bridge over ower Yí (1)	built	73 " 44
213.840	Yí station		74 " 25
219.440	Bridge over stream Tejera . . .	3 of 10m.	72 " 45
229.740	" " " Sarandí . . .	1 of 10m.	76 " 30
233 230	Stream Cuadra.	3 of 15m.	78 " 00
243.690	San Borja station		122 " 50
272.740	Carmen station.		155 " 50
292.290	Bridge over stream Las Ovejas .	1 of 15m.	138 " 50
296.490	Cuchilla Grande station		164 " 25
317·690	Pereira station.		165 " 89
339.540	Junction station		205 " 75
372.120	Castro station		162 " 30
399.620	Collett station		154 " 50
420 220	Bridge over river Negro	8 of 15m. & 2 of 10m.	88 " 00
433.470	Rio Negro station		125 " 00
469.420	Caraguatá station.		136 " 25
501.370	Tacuarembó station		144 " 25
531.370	Herrera station.		152 " 48
548.320	A Bridge.	1 of 10m.	133 " 00
554.080	" "	1 of 10m.	130 " 70
562.170	Rivera station		135 " 75
563.065	Stream Coronilla	1 of 10m.	132 " 25
577.780	" Hospital	2 of 10m.	141 " 75
582.070	San Luis station on frontier of Brazil		137 " 50
	98 culverts	Span of 1m.	
	22 do.	" " 2m.	
	22 do.	" " 3m.	
	8 do.	" " 4m.	
	21 do.	" " 5m.	

From San Luis. on the frontier of Uruguay with Rio Grande del Sud, to Passo Fundo the line has not been surveyed for a distance of more or less 500 kilometers; from the neighbourhood of Passo Fundo to Itararé the line belongs to the "Industrial Union of Brazil Coy" and the surveys should now be concluded; the first section of the line from Cruz Alta to the River Uruguay of 381 k. 502m. was presented last year for the approval of the

(1) This bridge has been built by the Central Uruguay Railway C.º who will allow the Interior of Uruguay Railway to cross if the two Companies come to an arrangement; the junction of the lines is 2 kilometers distant, the bridge being 634.84 meters long.

Brazilian Government, the technical conditions of this line being as follows:

Minimum radius	101.28 m.
Maximum gradient	25 m.
Length of straight line	158km.
" curved "	223km.502
" " " of minimum radius .	50km.512
" " level line	170km.476
" " line on gradient	105km.258
Earthwork ballasting per lineal meter. . .	5m.^{3}300

Besides the plans of this section presented for the approval of the Government the surveys have been already concluded on 142 kilometers from the River Urugnay to port Unión.

The ballasting per lineal meter proves that the surveyed section would have allowed of more favourable conditions for the laying down of this line of general interest without increasing the cost to an excesive figure.

The general technical conditions that the various sections of the Interoceanic line should maintain in Brazil and Uruguay will allow of the trains travelling at an average speed of 65 kilometers per hour, as stated by the concessionaries, in which case the journey from Recife to Montevideo or Colonia would be made in 78 1/2 hours, to Buenos Aires in 81 hours; to Mendoza in 97 hours; and allowing the trains from Mendoza to Valparaiso to only travel at 30 kiloms. per hour, having to climb the Andes, the journey from Recife to Valparaiso would be made in 109 hours, or 4 days 13 hours.

From Lisbon to Recife the Transatlantic steamers travel at 15 or 16 miles per hour and thus arrive in ten days; but by employing faster steamers such as those of the

Cunard, White Star, Inman, Norddeutsche Lloyd or Trasatlantique Companies and many others engaged on the Western ocean route, this journey can be made in 6 days, so that the journey from Lisbon to Montevideo, via the Interoceanic line, will only require 9 days 6 hours; or the same time to Colonia; 9 days 9 hours to Buenos Aires and 10 days 13 hours to Valparaiso.

The cost of passenger transport from English or French ports to the Plate or Valparaiso would be reduced to much less than what it now costs, and with a considerable saving of time.

In the best ships the passage from any of the European ports to the Plate is £ 40, to Valparaiso £ 80 and to Callao £ 90; these fares, which are so considerable as to impede economic passenger transit for distances, would be reduced by the interoceanic line. The present first class fare from Buenos Aires to Mendoza is $ 0.016 per kilometer, which would be a high rate for the passage from Recife to Valparaiso: fixing it at the equitable price of $ 0.012 the passage from Recife to Colonia or Montevideo would cost $ 61; to Buenos Aires $ 61.70, to Mendoza $ 74.26 and to Valparaiso $ 78.63

The following statement will give the time now occupied and the fares paid from English and other European ports to those of the Pacific, as compared with what would be entailed by using the interoceanic line.

STARTING POINT.	DESTINATION.	*Time now occupied by sea voyage.*	*Time occupied by interoceanic line and quickest steamer.*	*Fare by sea route.*	*Fare by sea and land route.*
English ports . . .	to the R. Plate.	21 days	11 days 6 h.	$ 200	$ 161
French " . . .	" "	20 "	10 to 11 days	" 200	" 161
" " . . .	To Valparaiso.	33 to 35 days	12 á 13 "	" 100	" 178
" " . . .	" Callao . .	37 " 39 "	16 á 17 "	" 175	" 253

It is unnecessary to make further comments to show the triumph which rapid and cheap communications will have attained between the ports of Great Britain and Europe and the most important cities of the Plate and the Pacific.

It may, however, be argued that the line from Recife to Valparaiso, passing through the Plate, will undoubtedly facilitate passenger transport and that it will also serve the industries and internal commerce of the Brazilian States and the Uruguayan, Argentine, and Chilian Republics, but that the transport of cargo from Europe will be absolutely nil as it will never be able to compete with the cheapness of maritime freights.

It is not out of place to examine this objection which has all the appearance of truth.

True it is that freights by sea are much cheaper than those by railway.

The intrinsic value of the first differs notably from that of the second, but if it be taken into account that for the more valuable manufactures the dangers entailed by the one are much greater than those offered by the other, and that insurance against accidents is much more costly for maritime transport, (calculating what this latter item represents on a ton of goods manufactured of silk, cotton, wool, or thread), it will be seen that the low price of transport for valuable merchandise completely disappears before that other factor of insurance that weighs so heavily on special cargoes, which, on well examining the question, so increases the apparently small freight by sea.

Let us now see what is the burden in the way of freight and insurance, laid on those 1.000 kilogrammes of merchandise proceeding from English or French ports to the Pacific.

One of the importing firms of this market, Messrs.

Rein & Co. (formerly the house of Mallmann) has been good enough to supply us with the average value of 1.000 kilogrammes of the manufactures which we are about to name:

Articles of silk, per 1.000 kilos, average	$ 20.000	
Articles of silk and cotton, per 1.000 kilos, average.	" 12.000	
Cachemires, cloths, woollens, mufflers, flannels, dress stuffs, merinos, ponchos, fine cotton stockings, etc., etc., average per 1.000 kilos. . . .	" 3.000	
Felt Hats, average per 1.000 kilos .	" 10.000	
Woollen " , " " " " .	" 3.000	
Average per 1.000 kilos		$ 9.600
Freight by sea from English or French ports to Pacific, per ton. . . .		" 25
Insurance, 2 %.		" 192
Interest during the time occupied by the voyage, 40 days, at 6 % . .		" 64
		$ 9.881

The cost of a ton of special manufactures proceeding from the ports indicated to those of the Pacific by sea, would be $ 9.881.

Let us now see what this same ton of merchandize will cost put in the Pacific ports, supposing the railway from Recife to Valparaiso be availed of:

Average cost of 1.000 kilos of merchandise at the manufactory	$ 9.600.00

Freight by sea to the port of Recife . . .	$	5.00
" " rail from Recife to Valparaiso at an average speed of 30 kilometers per hour.	"	65.53
Insurance by sea and land, $ 0.75 %. . .	"	72.00
Interest during the time occupied in transit, 20 days, at 6 %	"	32.00
	$	9.774.53

This is an important difference in favor of mixed transport, so that it would be convenient, as we have just seen to use the interoceanic line from the port of Recife for costly manufactures proceeding to the Pacific.

The works which have been decreed and surveyed for the port named, will allow of the transatlantic steamers working in its docks with the greatest facility and loading and unloading will be effected without prejudicial hindrances or delays.

Under these conditions, traffic to or from the Pacific can be carried on with all safety, it being proved that not only does this artery resolve itself into a financial problem of the greatest importance for passenger transport, but that it also solves advantageously the question of the carriage of cargoes of costly manufactures, favoring the merchants of the Pacific, who will be able to dispose of their merchandise with a saving of at least 20 days over the time employed by the Straits of Magellan route, which will in the future be relegated to cargoes of lesser value which do not require to avail of the saving in time effected by railway communication.

In whatever way this project be viewed, it is seen that it is destined to produce a revolution in the rapid communications of the world; indicating a route of vaster

importance than the opening of the isthmus of Panama or the Suez Canal.

It will be superior to the first-named by reason of the shorter time which will be occupied in communication between Australia, New Zealand, Chili and Peru and the European continent; it will surposs the second on account of the greater rapidity and comfort of communication between the same places and Great Britain and the Mediterranean and European Atlantic ports with equal distances to traverse in both cases, of the route via the Plate 6.500 kilometers will be by railway, the greater part of the sea and land voyage being in temperate climates, while, by the Suez route, three parts of the journey will be in the torrid zone.

The intercontinental and interoceanic lines, whose first destiny is to establish and render closer the chains of union and confraternity between the nations of the American continent, will be the most worthy work of the peoples who have initiated and will carry them out.

Population

OF THE SOUTH AMERICAN STATES.

CHAPTER X.

POPULATION OF THE SOUTH AMERICAN STATES

AND DEMOGRAPHIC REASONS JUSTIFYING THE ROUTE OF THE INTERCONTINENTAL AND INTEROCEANIC LINES.

The American Continent has 332.809 kilometers of railways open to traffic, and the two great projected arteries, the intercontinental and interoceanic lines, will join together the existing groups of railways.

The most rational route for carrying this junction into effect should run through the most productive and populated centers, joining, if possible, the principal cities, to whom cheap and easy means of communication, as afforded by first class arteries, are of the greatest importance.

To prove whether, by crossing the most populated districts of South America, the two projected arteries fulfil the conditions above indicated, let us first of all determine which are those districts and what number of civilized inhabitants they contain, so that we may definitely decide whether these two lines may constitute one of the greatest aspirations of an American.

The absence of data respecting most of the South American countries which would afford us the growth in population of their towns obliges us to estimate it

approximately, basing ourselves on the figures given by those towns which have regularly kept up their Civil Register.

In this respect the Uruguayan Republic has attained as perfect an organization as the most advanced countries; for this reason we can determine the coefficient of its growth in population with great exactitude. For this purpose we will take the figures relating to the births and deaths for the decade from 1882 to 1891.

Years.	*Births.*	*Deaths.*	*Growth in population.*	*Increase per 100 inhabitants.*
1882	21.719	9.640	12.079	23.8
1883	22.254	8.993	13.261	25.5
1884	21.781	10.278	11.503	20.5
1885	23.807	10.273	13.534	21.5
1886	24.712	11 537	13.175	22.1
1887	25.133	12.238	12.895	20.8
1888	25 832	11.739	14 093	22.0
1889	26.981	12.573	14.408	22.6
1890	27.889	14.473	13.416	19.2
1891	28.696	12.419	16.277	21.6
				219.6

The average physiological growth during the decade from 1882 to 1891 was therefore 22 per thousand.

According to the statistics for the year 1891, the population of the Republic was 750.658 inhabitants; if to this be added the natural growth 22 ‰ or 16.514 souls and the balance of the migratory movement during 1892. the population of the Republic at January 1st 1893 would amount to 776 580 inhabitants.

For the Argentine Republic we have only figures

respecting the city of Buenos Aires where, for the five years from 1887 to 1891, the increase was 14.4 per thousand,—a very flattering figure to the growth of the Argentine Republic, as it is well known that the conditions of vitality and fecundity in cities where there is a great agglomeration of people in a confined space are very inferior to those offered by rural towns situated in open districts.

As an example of this we give a comparison between the increase in population of the municipality and that of the rural towns in the year 1891, as follows:

Montevideo (Capital). . . .	14.0	per	1000	inhabitants.
Artigas (Departament) . . .	34.0	"	"	"
Minas " . . .	34.0	"	"	"
Durazno " . . .	32.0	"	"	"
Maldonado " . . .	31.0	"	"	"
Canelones " . . .	30.5	"	"	"
Tacuarembó " . . .	28.8	"	"	"
San José " . . .	28.8	"	"	"
Florida " . . .	28.7	"	"	"
Río Negro " . . .	27.8	"	"	"
Cerro-Largo " . . .	26.9	"	"	"
Rivera " . . .	25.4	"	"	"
Colonia " . . .	25.0	"	"	"
Salto " . . .	24.4	"	"	"
Rocha " . . .	24.3	"	"	"
Flores " . . .	22.6	"	"	"
Treinta y Tres " . . .	22.7	"	"	"
Paysandú " . . .	16.0	"	"	"
Soriano " . . .	12.0	"	"	"

The 18 departments into which our rural districts are divided give an average increase of 27.3 per 1.000, while the increase of the Capital is only 14 per 1.000—and for the purpose of our calculations we assume that the increase of

the Rural towns in the Argentine Republic is proportionally the same.

The physiological increase of the city of Rio de Janeiro, which has 800.000 inhabitants, is counteracted by the deaths being more than the births.

The sanitary statistics of Dr. Portugal for the year 1890 give the decreases in population, as follows:

BIRTHS.	DEATHS.
1889. . . 8.851	10.027
1890. . . 11.547	12.804

The City of Rio Janeiro, therefore, does not contribute any increase to the general population of the Nation; on the contrary, it gives negative quantities which, in the years of epidemic, amount to alarming figures, as in the year 1889.

In view of this circumstance, which is permanent in the city of Rio and also others such as Santos, we cannot accept for Brazil the same ratio of growth as for the Uruguayan and Argentine Republics.

The following statement taken from the Demographical Sanitary Statistical Return of Dr. Portugal, and amplified by us with figures relating to the River Plate cities, will give a comparison between the growth in population of these latter and the principal European cities.

CITIES.	YEARS.	BIRTHS.	DEATHS.	DIFFERENCES.		*Births per thousand deaths.*
				Births.	*Deaths.*	
				+	—	
London. . . .	1888	30,0 °/₀₀	19,9 °/₀₀	10,1 °/₀₀	..	1512,5
Paris. . . .	1888	25,9 °/₀₀	23,5 °/₀₀	3,4 °/₀₀	..	1114,0
Berlin . . .	1888	31,0 °/₀₀	23,1 °/₀₀	7,9 °/₀₀	..	1341,9
Vienna . . .	1888	33,4 °/₀₀	25,0 °/₀₀	8,4 °/₀₀	..	1336,0
Rio de Janeiro	1890	22,2 °/₀₀	24,6 °/₀₀	..	2,4 °/₀₀	901,8
Monte Video .	1887 to 1891	40,5 °/₀₀	26,5 °/₀₀	14, °/₀₀	..	1684,2
Buenos Aires .	1887 " 1891	41,9 °/₀₀	27,5 °/₀₀	11,4 °/₀₀	..	1669,6

In the year compared, when the sanitary conditions were favorable there werely barely 902 births per thousand deaths; and in the preceding year, 1889, when epidemic was rife, there were only 480 biths per thousand deaths.

Dr. Portugal adds: " As will be seen, the city of Rio de Janeiro is the only one which presents the phenomenon, singular on account of its prevalency, of the births being fewer than the deaths. The foregoing statement shows that with the exception of Rio de Janeiro, all the cities whose mortality is high, have also a large number of births, so that there is always a balance in favor of the latter".

The sad reality that the city of Rio Janeiro presents, of being always scourged with a death rate in excess of the births, requires that the increase in the population noticed from year to year should be supplied by immigration and by the influx into the city of the villagers from the neighbouring rural districts.

To reduce such a disastrous state of affairs in the preservation of human life alone, the idea has been formulated of changing the locality of the Federal Capital, and with thus object article 3 of the Constitution of the United States of Brazil establishes that the Government shall proceed to mark out a zone of 14,000 square kilometers on the central tableland of Brazil in order to remove the Federal Capital to that district.

Señor Gouls the astronomer was charged with the organization and direction of a scientific Commission to undertake the necessary studies in the interior region and to mark out the area destined for the site of the future Federal Capital. — This commission consisted of two astronomers, a doctor, five geographical engineers, a naturalist nnd two mechanical engineers with a military escort of fifty men.

The site elected and surveyed is on the table land of Goyaz, about 1.000 meters above sea level, in the locality mentioned in our chapter on the railways and is considered to be one of the healthiest in Brazil.

The towns of the River Plate, Montevideo and Buenos Aires figure in the foremost rank of the cities of the world so far as natural increase of population.

It is much to be regretted that statistics do not exist to enable us to ascertain more accurately the average of the increase of the population in Brazil, the Argentine Republic and other South American States, but Uruguay and Chili are the only two countries in this part of the world that have established the Civil Registry with an organization able through the annual returns to furnish the most complete information on this matter, and the following comparison will show the position of these two Republics:

	PER 1.000 INHABITANTS.		
	Births.	Deaths.	Increase.
Uruguay—1882 to 1891 . .	39	17	22
Chili—1880 to 1889 . . .	36	30	6

The increase in Uruguay is very notable and considering the similarity in the conditions of Montevideo and Buenos Aires we will for the purposes of estimate assign the same rate of increase (22 °/₀₀) to the Argentine Republic as was had in the Uruguay during the period 1882 to 1891.

To estimate the population of Brazil, for reasons noted further on taken from the Statistics of Dr. Portugal, we cannot allow a natural increase of population of more than 15 °/₀₀ and this is the rate we will take for our calculations.

For the other South American Countries whose principal

cities are not in the conditions which Dr. Portugal notes for Rio Janeiro, we have taken the average natural growth at 20 °/₀₀.

Señor Latzina, Registrar General of the Statistical Department of the Argentine Republic gives the population of that country on January 1st 1889 as 3.794858 inhabitants, including in this calculation the census of the Province of Santa Fé as taken in 1887 when it only represented 220.332 souls, whereas on the authority of Sr. Latzina himself that Province at the end of 1888 had 300.000 inhabitants owing to the large number of immigrants attracted by its fertile lands; thus the actual population of the Argentine Republic on the date mentioned should have been 3.874.858 inhabitants.

The movement of immigration during the three years 1889-1891 has been as follows:

YEAR.	Immigration.	Emigration.	Excess of immigration.	Excess of emigration.
1889 . . .	260.909	40.649	220.257	—
1890 . . .	138.407	82.981	55.426	—
1891 . . .	73.597	90.936	—	17.339

Taking the co-eficient that we have assigned to the Argentine Republic as natural growth, this, with the increase in population through immigration to the country, would give a population at the and of the year 1891 of 4.326,155 inhabitants; and allowing for the temporary paralization for the movement of immigrants to the River Plate, circulating for the year 1892 the natural increase only, the population on January 1st 1893 would number 4.421,330 inhabitants.

The populatian of Brazil was calculated by the statistician Santa Anna Nery, on the basis of the general census taken in 1872, as 14.002.335 inhabitants on January 1st 1889.

The actual number of immigrants that entered Brazil by the ports of Rio Janeiro, Santos, Victoria, and Desterro, after deducting the number of emigrants that sailed from the same ports was:

In 1889.	65.161	souls.
" 1890.	76.310	"
" 1891.	217.946	"

giving an effective total of 359.417 persons: and adding those who have entered by the ports of Río Grande del Sud, Paranaguá, Bahía, Pernambuco, and Pará, the total increase during these three years may be fairly estimated in 400.000 immigrants.

This the natural growth of the population augmented by the movement of immigration would give an approximate population on January 1st 1892 of 15.277.167 inhabitants, or on January 1st 1893 of 15.350.000, on the supposition that the immigration which in 1891 reached 217.946, had on account of the crisis which overtook the country in 1892 fallen to 73.000 persons for the whole country, a number that will not be considered exaggerated when it is borne in mind that although the immigratory movement has been somewhat checked, nevertheless it has not ceased to flow towards Brazil during the last year, because, although a great number of contracts celebrated between the Government and colonization companies have been cancelled, according to the Report of the Minister of Agriculture, Commerce and Public Works for the year 1892, more than ninety are still in force.

The "Statistical and Geographical Synopsis" of Chili for the year 1891 gives us as the population of that country according to the census of November 26th 1885 a number

of 2,527,320 inhabitants; bnt taking into account 50,000 Indians that existed in that year, and the population who were estimated to 15 °/₀ of the whole, the total number of inhabitants in Chili in 1885 should be taken as 2.956,412 inhabitants.

Upon this basis taking the average natural growth of the population in the ratio given by the returns for the census of 1875 and 1885, the population for the year 1891 has been estimated at 3.267,441 inhabitants.

This calculation is based on good logical grounds, as the increase in the population of Chili is purely natural, the tide of immigration never having flowed to its shores as it has done to the Republics of the River Plate and Brazil.

The number of foreigners settled in Chili is comparatively insignificant.

Excluding 51.880 Peruvians and Bolivians in the Provinces of Antofogasta, Tarapacá and Tacna, according to the census of 1885 there were only 35.197 foreigners in the old Chilian provinces, or 12 to each 1000 native inhabitants.

Thus to estimate the population of Chili on January 1st 1893 we have only to take for the year 1892 the natural increase, which, by the report of Señor Miguel Irarrazabal, Inspector of the Civil Registry of Chili, during the decade 1880-1889 averaged 6 °/₀₀, and this will give as the total population of the republic on January 1st 1893 about 3.287.045 inhabitants.

The population of the Republic of Paraguay according to the Statistical office of that country in 1890 amounted to 350.000 inhabitants, which, increased by the average rate of natural increase for the years 1891 and 1892, would give at the commencement of 1893 a population of 364.000 persons.

Bolivia, according to the Geographical Institute of Gotha

in 1888 had 2:303.000 inhabitants. As we have no details of the very small immigration that this country has attracted, we will only consider the increase of its population by the average annual natural growth of 2 %, which would give a total population on January 1st. 1893 of 2:492.841 persons, comprising 1:080.000 pure indians, 760.000 half breeds and 652.000 descendants of Europeans.

The Peruvian Republic, according to the census of 1876, had then a population of 2.621.814, and adding 350,000 the number more or less of savage indians, the total Peruvian population that year was estimated at 2.971.924.

The same census gave 18.082 as the number of foreign inhabitants, which shows that up to then migratory movement in Perú had been almost nil; in order to estimate its population for the 16 years between then and the present day we will only add the increase, which, according to the coefficient adopted in our calculations, is 838.976 inhabitants, giving, at January 1st 1893, a total of 3.460.820. Adding to this the 350.000 savages existing in 1876 and their natural increase which we will only estimate at 1 % on account of their fecundity being less than that of the half-breeds, the population of the Republic of Perú on the 1st of January 1893 would amount to 4.020.000 inhabitants including 560.000 savages.

In 1885 according to the Geographical Institute of Gotha, Ecuador had 1.094.661 inhabitants and more or less 200.000 savages.

By our calculations these figures will, at January 1st 1893, have amounted to 1.145.344, or, adding 214.000 savages, to a total population of 1.359.344 inhabitants.

The only addition we have made to the population of 1885 has been the natural growth as we have no data

to show the movement of immigrants, which, however, as in Perú, will be very small.

The Geographical Institute of Gotha assigns to the Republic of Columbia in 1884 a population of 3.320.550 inhabitants, and adding to these figures the natural increase during the 8 years to the present date which we have estimated at 20 per thousand, the present population would be 3.890.571. We would note as a proof of the result of our calculations, that they coincide with the figures given in the treatise on Columbia publsihed in 1891 by the Bureau of the South American Republic of Washington.

According to the official edition of the "Historical, Geographical and Political Description of the Republic of Columbia" published in Bogotá in 1887 the indigenous population was in 1886 more or less 200.000, and with a probable natural increase of 10 °/₀₀, the total population of the Republic of Columbia should, on the 1st of January 1893, amount to 4.102.571 inhabitants.

To calculate the population of the United States of Venezuela, we must take as a base the figures given in the 1893 report of the Geographical Institute of Gotha, as the population for 1891, viz 2.323.527, increased by the natural growth in the year 1892. The population on the 1st January 1893 should therefore be 2.369.977 inhabitants.

We have no figures for the increase of foreigners, and even though the Public Powers have on their part done all in their power to place immigrants on their rich and fertile lands, the number of strangers in the United States of Venezuela will not exceed 100.000.

Finally, the population of English, French and Dutch Guiana, which in 1887 amounted to 370.000, will, with

its natural increase, have numbered on January 1st 1893, about 410.000 souls.

The following is a general statement of the extent and population of the South American countries, compiled from the figures we have just given.

EXTENT AND POPULATION OF SOUTH AMERICA.

STATES.	Superficie.	Population at 1st January 1893.	Number of inhabitants per 10 square kilometers including savages.	Number of inhabitants per 10 square kilometers excluding savages.
Uruguay. . . .	178.700	776.580	43.5	43.5
Chili	753.216	3,287.045	43.7	42.3
Perú	1.072.496	4 020 000	37.5	34.8
Columbia . . .	1.330.875	4.102.571	30.8	28.5
Ecuador	643 295	1,359.344	21 1	17.8
Bolivia	1.222.250	2.492 841	20.4	14.1
United States of Brazil	8.337.218	15.350.000	18.4	17.7
Argentine Republic	2.894.252	4,507.538	15.6	15.6
Venezuela . . .	1.539.398	2.369 997	15.4	15.4
Paraguay . . .	253.100	364.000	14.4	14.4
Guianas	396.000	410.000	10.3	10.3
	18.620.800	39.039.916	—	—

The population of the South American States should on January 1st 1893 be between thirty nine and forty millions.

We will now proceed to determine the elements which will allow us to indicate the districts over which these 39:000.000 inhabitants are distributed.

The regions bordering on the Atlantic and Pacific Oceans are the more densely populated as will be seen by the following statements.

BRAZIL.

STATES.	Superficie in kilometers.	Population at December 31 of 1888 ("Sta. Anna Nery.")	Natural and immigratory increase at 22.1 °/₀₀.	Population in 1892.
Pará	229.942	407.350	36.009	443 359
Maragnón	459.884	488.443	43.178	531.621
Piauhy	301.797	264.936	23.597	290 530
Ceará.	104.250	952.625	84.212	1.037 837
Río Grande del Norte.	57.485	308.852	27.302	336.154
Parahyba	74.731	496.618	43.904	540.522
Pernambuco . . .	128.395	1.110.831	98.153	1.209.084
Alagõas	58.491	459.371	40.608	499.979
Sergipe	19.090	232.640	20.565	253.205
Bahia.	426.427	1.821.083	160.984	1.982.067
Espíritu Santo. . .	44.839	121.562	10.746	132.308
Minas Geraes . . .	574.855	3.018.807	266.862	3.285.669
Municipio Neutro . .	1.394	406.958	35.975	442.933
Río de Janeiro. . .	68.982	1.164.438	102.936	1.267.374
San Paulo	290.876	1.306.272	115.474	1.421.746
Paraná	221.319	187.548	16.579	204.127
Santa Catalina. . .	74.156	236.346	20.893	257.249
Río Grande del Sud .	236.553	643.527	56.888	700.415
	3.373.466	—	—	14.836.179

Of the 15.350.000 inhabitants of Brazil, 14.836.179 live in the States bordering on the Atlantic and 513.821 in the interior States of the Amazon, Matto Grosso and Goyaz, in which latter figure 120.000 savages are included. These half million souls occupy 4.963.752 square kilometers, almost three fifths of the whole of Brazil, or at the rate of 0.10 persons per square kilometer.

ARGENTINE REPUBLIC.

PLACE OR PROVINCE.	Superficie.	Population at Dec: 31 of 1888. (Latzina).	Natural and immigratory increase at 39 6 °/₀₀.	Population at 1st January of 1893.
Capital of the Republic.	181	500 000	64.000	564.000 (1)
Province of B. Aires.	311.196	850.000	134.640	984.640
Santa Fé.	131.582	300 000	47 520	347.520
Entre-Ríos	75.457	248 700	39 392	288.092
Corrientes	81.148	200.000	31.680	231.680
Córdoba	174 768	427.600	51.733	479.332
San Luis.	75.917	100.000	15.840	115.840
Mendoza.	160.813	137.200	21 732	158 932
San Juan	97.505	102.403	16.220	118.623
La Rioja.	39.030	80.000	12.672	92.672
Catamarca	90.644	110.000	8.624	118.624
Santiago.	102.355	209.000	33.104	242.104
Tucumán	24 199	202.800	32.123	234.923
Salta	128 266	150.000	23.760	173.760
Jujuy	45.268	55.800	8.838	64 638
National Territories .	200.000	150.000	23.760	173.760
	1:738.329	—	—	4:389.140

The most populated districts of the Argentine Republic, 1.738.329 square kilometers in extent, contain 4.389.140 inhabitants or a the rate of 2.6 per square kilometer.

The population of the Chilian Republic is densest south of Santiago as far as the Magellan territory and northwards to the Province of Atacama; it amounts to 3.099.054 inhabitants and occupies 225.216 square kilometers or at the rate of 13.7 souls per square kilometer.

The Magellan territory may be called a desert; with 195.000 square kilometers, it has barely 3111 inhabitants, or 0.016 per square kilometers.

The provinces of Atacama, Antofogasta, Tarapaca and

(1) The Municipal Statistes give the population of Buenos Aires at the beginning of 1892 as 550.000 which agrees with our calculations based on the figures given by Latzina in 1888, increased by the natural growth of the Federal Capital from 1887 to 1891, viz: 14.4 °/₀₀ and the average immigratory increase for the years 1888 to 1892, viz: 17.6 °/₀₀.

Tacna, 333.000 square kilometers in extent, have a population 187.331 (0.57 inhabitants per square kilometer).

The population of Bolivia is mostly settled in the Departments of La Paz, Cochabamba, Oruro, Potosí, Tarija to the west of the Pilcomayo, in part of the Department of Chuquisaca and in part of Santa Cruz: this extent of about 450 000 square kilometers comprises a population of 2.000.000 inhabitants; the rest of the Republic composed of the Department of Beni and the greater part of Santa Cruz, Chuquisaca and Tarija, 772.250 square kilometers in extent, has a population of about half-a-million, of purely indigenous breed.

It is calculated that the part of Perú enclosed by the rivers Huallaga, Ucayalí and Madera, 500.000 square kilometers in extent, is inhabited by 350.000 savages (0.7 per square kilometer); the rest of the population composed of 3.670.000 souls, is spread over 372.496 square kilometer (6.4 per square kilometers) in the Departments of Piura, Cajamarca, Amazonas, Lambayeque, Libertad, Ancachs, Lima, Junin, Huanúco, Huancavelica, Ayacucho, Ica, Apurimac, Arequipa, Moquegua in the Western of the Huallaga River (Department of Loreto) and in the Southern part of the Departments of Cuzco and Puno.

Ecuador is divided into 17 provinces, of the the Galapagos Isles form one: its population is chiefly settled in the provinces of Pichincha, Azuay, Guayas, Chimborazo, Esmeraldas, Tungurahua, Manabí, Loja, Azogue or Cañas, Bolívar, Carchi, Oro and Rios, and in the western part of the Eastern provinces, occupying two fifths of the area of the Republic, or about 257.000 kilometers, which gives an average civilized population, including subdued savages, of 4.4 per square kilometer.

The population of the Columbian Republic is mostly

settled in the western part of the department of Cauca, in the departments of Panamá, Bolivar, Magdalena, Santander, Antioquía, Boyacá, Tolima and the extreme west of Cundinamarca, occupying an area of about 900.000 kilometers, equal to, excluding savages, 4.21 per square kilometer.

The population of Venezuela is concentrated in the Federal district and in the States of Bermudez, Carabobo, Falcon, Guzmán Blanco, Lara, Los Andes, and Zamora, about 400.000 kilometers in extent, equal to 5.92 inhabitants per square kilometer.

According to this, the population of South America is mostly settled in the zone of land which starts from the confluence of the Amazon, runs down the Atlantic coast as far as the 40th parallel and ascends the Pacific coast as for as Panamá, the inferior limit of which zone may be determined as follows: – by the shores of the rivers San Francisco and Paraná, part of Paraguayan territory, then following the Paraná as far as the South border of the Argentine Austral Chaco, ascending again along the eastern side of the Andes as far as the Southern border of the Department of Zamora in Venezuela, then following the left bank of the river Orinoco until it runs into the Atlantic, and then the English, Dutch, French and Brazilian Guianas as far as the mouth of the Amazon.

The area and number of inhabitants contained in this more peopled district is as follows:

STATES.	Area of territory populated.	Population not including savages.	Nº of inhabitants per square kilometer.
Brasil	3.373.466	14.836.179	4.39
Argentine República .	1.738.329	4.389.140	2.65
Uruguay	178.700	776.580	4.35
Chili	225.216	3.099.054	13.74
Bolivia	450.000	2.000.000	4.44
Perú	372.496	3.670.000	6.45
Ecuador	257.000	1.141.080	4.44
Colombia	900.000	3.793.000	4.21
Venezuela	400.000	2.969.997	5.92
Paraguay	253.100	364.000	1.44
Guianas	396.000	410.000	1.03
	8.544.307	36.848.930	4.32

The populated port of South American is, therefore, 8.544.307 square kilometers in extent and possesses 36.848.930 civilized inhabitants, giving an average of 4.32 per square kilometer.

The remainder of the territory may be said to be desert, it is 10.076.493 square kilometers in extent, with a population, mostly savage, of 2.191.186, equal to the low proportion of 0.22 per kilometer.

As will be seen, the populated and civilized part of South America possesses 4.32 inhabitants per kilometer and 31.242 kilometers of railway being worked, equal to one kilometer for every 1179 inhabitants.

North and Central America with a population of 4.24 inhabitants per square kilometer, have 301.567 kilometers of railways, or one kilometer for every 286 inhabitants.

From this it will be seen that while the density of population of the States of Northern and Central America is almost equal to that of the populated regions of the

South, the means of communication of the former are in proportion to those of the latter as 4 to 1, from which fact arises the isolation and want of interchange among the towns of the South.

The two international lines proposed will thus supply an important want of these districts, crossing as they do, the centre of the South American countries populated by 36.845.366 civilized inhabitants. They will connect the principal centres of population, as the Interoceanic line from Recife to Buenos Aires and Valparaiso, by means of the existing combining lines, will communicate with the cities of Bahia, Rio Janeiro, San Paulo, Santos, Curityba, Porto Alegre, Asunción, Montevideo and Santiago (Chili); whilst the Intercontinental line, by means of connecting lines already made, would unite the cities of Montreal, New York, Washington, Philadelphia, Brooklyn, Chicago, Boston, San Louis, Baltimore, Cincinatti, San Francisco, New Orleans, and México; and in South America the main line and branches will link together Bogotá, Caracas, Quito, Lima, Sucre, and by connecting lines its trains will run to Rio Janeiro, Montevideo, Buenos Aires, and Valparaiso.

(See maps of South American railway system).

No one doubts nowadays that the marvellous progress of the North American Countries is in great manner due to the transport and facilities afforded by its railways, which, with the assistance of European immigration, have tranformed deserts into centres of life, activity and work; have augmented the public and private wealth; have exercised a most powerful influence on the political and social relations, linking together large populations in closer bonds of brotherhood, making uniform the local customs, and establishing that condition of affairs which has so much contributed to the advancement of the countries.

In South America, Brazil, Uruguay, the Argentine Republic and Chili all owe to this same influence their great progressive advancement, although in their territories the means of communication have only thus far been of local importance, each nation having made its own railway system for its particular wants, without studying the part it should take in the system of universal communication. In South America the railways are in the condition of navigation companies not permitted to trade further than the frontiers of their respective countries and are thus deprived of the opportunity of extending their influence and accomplishing the grand aim of endowing the continent with the means of easy and rapid communication.

Thus it will be recognized that the problem of the projected international lines to unite all the cities of the South American continent is of the highest importance as by their means they will bind together 125.000,000 of people, who at present are divided into independent groups, and they will immensely influence the consolidation of the races that the future of the world anticipates in the ordinary march of affairs for the world of Columbus to open up the immense riches to be found and opened up which are at present unknown, but which these two great lines will place in direct communication with the outside commercial world.

Ports and Railways.

CHAPTER XI.

THE PORTS AND RAILWAY LINES

OF THE ORIENTAL REPUBLIC OF URUGUAY CONSIDERED AS NECESSARY ELEMENTS OF RAPID COMMUNICATION BETWEEN THE ARGENTINE REPUBLIC, CHILE, PERÚ, BOLIVIA, PARAGUAY AND RIO GRANDE DEL SUD.

Along the great extent of coast-line of the Republic bordering on the Atlantic Ocean and the River Plate are several natural ports of importance, in the first rank of which are the bays of Montevideo, Maldonado and of Colonia.

The question of the construction of a port in the bay of Montevideo has occupied the attention of former Governments as well as of the present one. The want of success which had attended the various attempts to arrive at a solution of this important problem, induced the Government in accordance with a decree dated January 16th 1889 to again call for projects for the por of Montevideo, and up to May 21st of the same year, on which date the term allowed for presenting them expired, twenty four were sent in.

These projects were passed on to the General Council of Public Works who, after a most careful examination of them, issued on November 17th 1890 a voluminous

report advising the acceptance of the project presented by Doctor Don Guillermo Rigoni, on the ground that it fulfilled all the technical conditions demanded by the council. The synthesis of this report is contained in the following

GENERAL SUMMARY.

Lastly, the council, in accordance with the conclusions deduced in the ten parts of the present report, are of opinion:

A.

WITH RESPECT TO THE TECHNICAL PART OF THE OUTER WORKS.

1. That all the projects presented are wanting in such data to fix in detail the position, dimensions, form, class and approximate cost of all the works.

2. Notwithstanding this deficiency, it is possible, with the aid of the data and information collected and the examinations made by the Corporation or some of its members, to arrive at the general technical principal which should serve as a base for the arrangemeat of external works of Shelter and protection.

3. Any port project which is rational should be drawn up on this base and be in accordance therewith.

4. The Port project, from a commercial point of view, can be studied separately, once the outer works (dykes, break waters), have been definitely fixed.

5. In order to establish all the elements of the Port in a detailed and definite manner, careful and complete surveys are necessary, no matter what project be adopted.

6. The formation of the Commercial port, which has as its basis the extension of the Northern part of the peninsula, requires specially careful examination, with respect to the present levelling of the zone frequently inundated by water, both from the River and rain.

7. Such surveys should be carried out with the aid of port and marine experts of every class, whose experience should be availed of, as is counselled by the most celebrated engineers and is the custom in the most civilized countries.

8. Experience shows that notwithstanding all the precautions and measures adopted by engineers when making ports on sandy shores, it is impossible to completely prevent the entrance therein of a certain quantity of sand, ooze, and detritus.

9. The engineers should use every effort towards the reduction of the deposits and the prevention, as far as possible of their formation, seeing this latter cannot be entirely avoided.

10. When arranging port works it is absolutely necessary to determine the general course or current of the waters: if they are favorable, the works must be modified so as to prevent any stoppages.

11. The general water currents in the Bay of Monte Video are inimical to the preservation of deep water, as is shown by a comparison of old soundings with recent ones, daily experience, and common sense.

12. The real and principal cause of the blocking-up of ports and of the formation of sandy and other deposits formed along the coasts, has been demonstrated by the eminent sailor Cialdi who attributes them to the movement imparted to the waters by the predominating winds, and not, as was formerly supposed, to the shore currents.

13. This movement which Cialli calls a "current wave", disturbs the depths, drags along the sands, and partly deposits them on the shores, where in time they accumulate.

14. The winds from the South-west (pamperos) are those ruling in Montevideo, and, therefore, those which have most bearing on the invasion of the Bay by the sands from outside.

15. Every rationally and conceived Port project must above all suppress, or reduce as far as possible, the "wave current" which the pamperos raise in the river waters.

16. Any project must therefore be rejected in which are proposed dykes, facing the bay. but a long distance from Monte Video.

17. The following is the general principle which should serve as a base for the arrangement of the external works of shelter and protection.

> To prevent as far as possible the entrance of the "wave current" raised by the pamperos and to alllow instead entry to the port and a certain part of the principal current which runs from Piedras Blancas or Punta Cibils to Punta Guaraní.

18. As it will be necessary in the future for the Port to be of a greater depth than that shown in any of the projects, none of which provide for more than 22 feet, it will be impossible to avoid external dredging at any of the dykes indicated in the plans presented.

19. As is shown by the adjoined statements these dredgings are possible from a financial point of view

20. There is therefore no object in carrying out the works at a depth of 22 feet, seeing that by means of a supplementary dredging of only two feet, the said depth

can be obtained with greater economy thus forming, a much more sheltered roadstead near to Monte Video and almost entirely protecting the bay from the pampero "wave current."

21. The outer dyke of the bay can therefore be placed outside a line running from Punta Cibils to Punta Guaraní, until a depth of 20 feet is reached, which in the future can be increased to 30, so that, whilst fulfilling the demands of navigation both by day and by night, this dyke will yet be as little distant as possible from the line mentioned, and can also be cheaply and easily extended, should it be thought necessary to prolong it in the direction of the river.

22. Project Nº. 15 presented by Engineer Dr. Guillermo Rigoni is the one which contains, in general, all the technical conditions laid down by the Council.

23. The position and general bearings of the outer dyke: the mouths of entrance and exit for the principal current, also allowing for the cleaning currents produced when the ruling winds have passed; the position of these same mouths for meeting the demands of navigation in any weather and at any hour of the day or night, the slight and beneficial agitation which will exist in the bay, offer in the council's opinion, reasonable guarantees of success in maintaining, and even of increasing, the sheltered depths and also the entrances and exits.

24. The external works of shelter and protection, as devised by Sr. Rigoni, can be somewhat modified, from details afforded by surveys supplementary to those presented and already in the council's possession.

II.

WITH RESPECT TO THE COMMERCIAL PORT.

1. That, after providing for entrance to, exit from, shelter

and protection for the port, its prosperity very essentially depends on the reduction to a minimum of the cost of working the ships which frequent it and on the lowering of the taxes on the merchandise brought by the vessels.

2. The said working expenses can be very notably reduced if the ships, instead of having to wait in the port, can carry out their operations safely, comfortably and rapidly.

3. This reduction of expenses demands, therefore, that the fittings of the Commercial Port must be perfect, the machinery must be powerful in order to shorten the unloading, verification, exit or loading & of the merchandise.

The conditions which should characterize a modern commercial Port are set forth on pages 3 and 4 of this report.

4. The Commercial Port should be established in the Bay. either by placing the loading and discharging Moles on the North beach, or by building them in the Bay itself should it be possible to overcome quickly and at a moderete cost the difficulties raised by some of the coast property holders.

5. In the Council's opinion, the first idea is preferable viz, to run the moles out from the peninsula, which is the centre of activity of the movement in the Port.

6. The Commercial Port should be able to cope with a much larger traffic than the present: say two million and a half or three million tons.

7. The usual and most convenient shape for a Commercial Port is that of several moles running out obliquely from the shore, with docks of moderate width between them and protected by a breakwater placed 250 to 300 meters from the end of the moles.

8. Should it be considered impossible to run the moles out from the shore itself, Señor Rigoni's idea could be accepted, viz: to place them in front of the shore, but

with the addition of wharves in an oblique position to the general mole.

9. The dimensions of the moles should be calculated on the basis of 550 tons per meter length of mole.

10. A traffic of three million tons could therefore be handled with five moles, of the shape and dimensions shown in the sketch: the said mole to be furnished with powerful cranes of various sizes, sheds, deposits, rails, &.

11. These five moles can be built by degrees, in accordance with the demands of the traffic.

12. On account of the topographical features of the Northern part of Montevideo, it is absolutely necessary to arrange for the drainage and hygiene of the same, before constructing the commercial port.

13. No estimate of the works can be formed except by comparison, and in this form the risk is run of spending much more than is really necessary.

14. Once the woks are completely finished they cannot cost much more than fifteen million dollars, and in forty years the State could amortize this capital by means of an annuity of $ 1.733.154 which would begin to be paid at the end of the fifth year from the commencement of the works.

15. The financial calculations for the realisation of the works should not be based on the lands gained from the sea.

16. The State should always keep its river rights, and should it be convenient to encroach on the Bay, it must be almost exclusively for forming new lands for extending the port, public promenades etc:, but never with the idea of selling the greater part of the land reclaimed, the immense cost of the formation of which can only be regained in the distant future.

17. Minute and complete surveys are absolutely necessary in order to arrive at a true estimate of the cost of the works.

18. In the opinion of the Council, these surveys should be carried out by the author of the project of external works of shelter and protection which may be accepted by the Public Powers; if the Council's recommendation be adopted, this person will be Señor Rigoni.

19. The said surveys would be carried out with the help and under the control of a Committee of National Engineers, and in accordance with a programme laid down by the General Council of Public Works previously approved by the Public Powers.

20. On the conclusion of the final surveys a programme will be drawn up showing the position, number, class, shape and dimensions of all the works, as also the installations for commercial purposes, machinery etc, and in accordance with the said programme, international tenders would be called for their construction, unless the State should prefer to contract direct with a private firm.

C.

EXTENSION OF THE COAST. BOUNDARY SEA WALL. HYGIENE.

1. The widening of certain portions of the coast is necessary, not only for the convenience afforded and the easy working of the Commercial Port, but also for the equally important questions of public hygiene and ornament.

2. Such extensions are only permissible at those points of the coast where there is not much depth and which cannot be used in any way, now or in the future, for Port installations.

3. The lands reclaimed from the sea should be of small

extent, and it might be convenient, by means of a wall parallel to the one now existing in the Aguada to set apart a limited space for a park and public walks.

4. Later on and in accordance with the law, the broken lines of the península, to the South and West of Montevideo can be straightened, and new gardens formed with the lands so gained from the River, the positions for which have been laid down in the general plan of adornment and hygiene projected by the Municipality.

5. As it impossible for the sewers to shoot the matter they carry off into one main sewer surrounding the city, some other method must be adopted.

6. This would be, in principle, to establish a low point of the coast, a large deposit into which two sewers should open.

7. The establishment of a main sewer or sewers is of undeniable and urgent necessity, especially in the Northern part of the city, and will form the subject of very minute study when the definite surveys of the Port are carried out.

8. The question of the adornment which harmonizes most with the general works mentioned, will also be a matter for special study by an artist of renown.

This council considers that with the foregoing report it has fulfilled the mission entrusted to it, and therefore has the honor to present it to your Excellency for consideration.

May God guard Your Excellency many years.

R. de Arteaga,
President.

José M. Castellanos,
Secretary ad-hoc.

The Minister of Foment prepared an ante-project for the construction of the port in the Bay of Montevideo, disagreeing with some of the technical conditions laid down by the Council as being necessary for the stability and security of the port works, and this, together with a project presented by Señor Buette, was submitted to a committee of engineers composed of Messrs. Juan Bautista Zanetti, Julio Leroy, Alberto Farriols, Felipe Victora and Alceste Battiste, who, on the 12th of April 1892, issued their report, the conclusions of which were the following:

RESUMEN.

In conclusion, the Committee admit:

EXTERNAL WORKS.

1. *Unanimously:* The utility of an outer breakwater.

2. *By a majority of votes:* The utility of the breakwaters projected by Señor Rigoni, with the modifications that may be made in the final surveys.

INTERNAL WORKS.

3. *By a majority of votes:* The utility of the internal dykes projected by Señor Rigoni, with the slight modifications that may be counselled in the final surveys, as in the case of the outer dyke.

COMMERCIAL PART.

4. *By a majority of votes:* That the Commercial port adopted should be that formed by a boundary sea-wall in the Northern part of the city with moles running from it obliquely; adhering, as regards their position and dimensions, to the results of the final surveys.

Señor Felipe Victora, who composed the minority of the Committee, also reported, giving the following.

CONCLUSIONS

a. I consider the outer breakwater proposed by Señor Rigoni unacceptable, even with the modifications that may be proposed by the future Commitee of surveys on the arrangement of the bay.

1. As dangerons to the preservation of deep water.

2. As not actually necessary.

3. Because the services it would render to navigation would not be commensurate with its high cost.

b. That the works of the anteports of the Minister and of Señor Rigoni, even though placed in the most convenient part of the Bay, would have to undergo certain modifications, as regards their definite position and shape before they could be considered to fulfil the conditions of an acceptable ante-port project.

c. That in the Minister's report the true financial phase of the port project is studied and appreciated.

d. That general studies of the special conditions of the system of the Bay are indispensable.

e. That whatever may be the work accepted or projected it should be carried out by degrees.

f. That the most necessary works and those of recognized utility should be carried out first, and that the effects produced by their development should be studied before proceeding with the others.

Having thus terminated the work entrusted to me by your Excellency, I have the honor to salute Y. E,

Montevideo, April 12th 1892.

Felipe Victora.

In view of this state of affairs and of the diversity of

opinions existing with respect to a matter of such importance for the future of the Republic, the Executive Power submitted all the antecedents of the subject to the General Assembly, accompanying them by the following message and project of law:

Executive Power.

Montevideo, July 12th. 1892.

The Honorable General Assembly,

The Executive Power has the honor to submit to you all the antecedents respecting the project for the Port of Monte Video in order that you may be good enongh to resolve what you think most prudent.

As you will see, in response to the call made, twenty four projects have been presented, the examination of which has been a matter of long and laborious study by the scientific committees appointed to report on them.

As was his duty, the Minister of Foment, after a lengthy examination, as being a work of immense importance for the national interests, has drawn up an ante project in accordance with his opinions, and the Executive Power in its turn, after duly considering all the antecedents referred to, is inclined to support the theories put forth by the said Minister in his report, considering them more adequate to our necessities and of more practical and economical realization: these theories can be condensed as follows:

1. To eliminate from the project the costly outer dyke, if, as is stated by the Foment Minister, it should, after the last and definite surveys, prove not to be necessary, and if, also, it would be an active cause of large alluvial deposits which could not be easily removed.

2. To limit the port to one composed of well sheltered docks, with a convenient anteport, the whole of the works enclosing a comparatively small area of water which could be deepened without great expense: for this end dredging would be adopted as an essential means.
3. To project a length of sea walls that would accommodate a merchandise movement about three times as large as that dealt with in our Port in the time of greatest prosperity.

The foregoing is an abstract of the ideas contained in the project of law accompanying this message, and which should serve as a base for the definite surveys and project.

Should the Honorable Chambers sanction this project, modifying it in detail as may be thought fit, a resolution would, in the opinion of the Executive Power, be obtained of the problem which has for so long back been occupying the attention of the Public Powers, and in a short time we could commence the work of the port, thus supplying one of our greatest national necessities, and one which the interests of commerce and navigation urgently demand.

In view of the details accompanying this message, the Executive Power considers it unnecessary to dilate at further length on this important subject, leaving the matter to the judgment of the Honorable Chambers.

The Executive Power begs the Honorable Chambers to receive its salutations.

JULIO HERRERA Y OBES.
J. A. Capurro.
Francisco Bauzá.
Manuel Herrero y Espinosa.
Luis E. Pérez.
Eugenio J. Madalena.

PROJECT OF LAW.

The Senate and Chamber of Representatives of the Oriental Republic of Uruguay, assembled together in General Congress

DECREE

Article 1st. The Executive Power is authorised to proceed with the definite surveys of the project of the Port of Montevideo, on the following bases:

a. To carry ont the surveys and prepare the plans of the project under consideration, the Executive Power shall appoint a Committee, which shall be under the orders of the Ministry of Foment, and shall be composed of engineers of recognised competence, one or two of whom shall be foreigners with special experience in the matter.

b. This Committee shall study whether, in the first place, the construction of an outer breakwater for the bay of Montevideo is absolutely necessary, and in the second place, whether the same is convenient, bearing in mind the probable danger of alluvial deposits which the said work may bring in its train, and whether its cost would not prove to be out of proportion to our maritime and commercial movement, in which case it should be struck out of the project.

c. To project docks for loading and unloading ships along the North and West coasts of the city, these docks being extended in time to the South side.

d. These docks must be perfectly sheltered by breakwaters

placed at such a distance that they will serve at the same time for the formation of an ante-port.

e. The area of water to be enclosed by the works referred to will be about 250 hectareas: the docks will be at least 200 meters wide, and the length of the wharves must not be less than 8.000 lineal meters.

f. The depth of the port and of the ante-port will be at least 21 feet at ordinary low water, and the entrances will have 18 to 19 feet under the same conditions. These last depths can be increased either by making use of the natural currents of entrance and exit of the waters, or by mechanical means.

g. For deepening the port dredging will be the essential means used, but without prejudice to the use of the natural currents, as an auxiliary, especially for renewing and cleaning the waters, in which case discharge from the main sewers and surface drains in to the docks must be suppressed.

h. As regards the other details respecting the bearings and position of the entry to the port, break-water systems, sea-walls, hydraulic pipes, general stores, port machinery etc:, the committee of Engineers will design the ones they consider most suited to the bay, the bottom, the materials disposable for the said object etc., etc.

i. When designing the works alluded to, there must be taken into account their solidity and utility for the loading and unloading of the ships, reserving the right to propose such economies as may be the considered reasonable.

Art: 2. The Executive Power is authorised to expend up

to $ 150.000 on the surveys and projects referred to, or to contract for these surveys with any firm or company of constructing hydraulic engineers that, in their opinion, is qualified to carry them out under the inspection of the Committee of Engineers appointed by the Executive Power, and on condition that, if tenders be called, for the works and the concession be granted to the said firm or Company, the cost of the surveys and plans will be included in that of the works to be carried out: on the other hand, they will be paid for at a price be arranged beforehand.

Art: 3. After the definite final survey of the port project is concluded, the list of conditions drawn up, and the cost fixed, the Executive Power will submit all the details to Congress, so that, should it be thought convenient, its approval may be accorded thereto, and the funds necessary for carrying out the works be authorised.

Art: 4. Once the project has been approved, the construction of the port will be offered to public tender, in accordance with the conditions established in the law, for which end the detailed plans and schedule conditions will be established, and the proposal which, in the opinion of the Executive Power, is most advantageous as regards price and sincerity will be accepted.

Art: 5. All laws and decrees which may be in opposition to the present one are annulled.

Art: 6. Let this be communicated etc.

J. A. Capurro,

The question of the port of Montevideo is now waiting the resolution of the Legislative Body, which is expected at any moment, and it is to be hoped that they will bear in mind the great public convenience of arriving at a judicious solution of this question on which hangs the

future prosperity of our commerce and our industries, and also quick communication with the neighbouring states and Paraguay, Bolivia, Perú etc.

The railway lines included in the general outline will be at the service of the port of Montevideo, which lines by their developments are destined to carry the influence of the port beyond our frontiers.

The extreme points of those lines are the following:

Montevideo and Fray-Bentos.
" " Paysandú.
" " Santa Rosa.
" " Rivera.
" " Artigas.
" " Cebollatí Port (Lake Merim.
Colonia " San Luis, the Uruguay Interier Railway, which will communicate with the Port of Monte Video by three distinct arteries, viz : the Western, Central and North Eastern lines.

We will detail the importance of these lines for communication with the Pacific States, Bolivia, Paraguay and Brazil, giving, at the same time, their length in kilometers, the features of each line and the time which will be occupied in running over them.

Through communication between Montevideo and Bolivia.

WESTERN RAILWAY.

(From Montevideo to Fray-Bentos).

EXTENSION THAT THIS ROUTE WILL HAVE CROSSING THE ARGENTINE REPUBLIC AND BOLIVIA RUNNING THROUGH

JUJUY, POTOSÍ, AND SUCRE TO FORM A JUNCTION WITH THE INTERCONTINENTAL LINE :

COUNTRIES.	LOCALITIES.	KILOMETRIC EXTENSION.				Gauge. Meters.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Oriental Republic of the Uruguay	From Montevideo to Rosario			149.000		1.44
	From Rosario to Mercedes and F. Bentos.				194.000	"
Do. and Argentine Republic	Fray Bentos to Gualeguaychú including crossing the River Uruguay				25.000	"
Do.	Gualeguaychú to Basavilbaso	99.700				"
Do.	Basavilbaso to Port Paraná.	222.800				"
Do.	Port Paraná to Santa Fé crossing River Paraná.				24.000	"
Do.	Santa Fé to Pilar.	63.200				1.00
Do.	Pilar to frontier of Córdoba and Santa Fé Provinces	81.800				"
Do.	From frontier to the junction with Central Córd. Railway.	210.000				"
Do.	Córdoba to Tucumán.	547.000				"
Do.	Tucumán to Jujuy	352.300				"
Do.	Jujuy to Bolivian frontier				280.000	"
Bolivia.	Argentine frontier to Potosí and Sucre				420.00	"
		1576.800		149.000	943.000	

It will be thus necessary to make a railway journey of 2669 kilometers from the port of Montevideo to arrive at Sucre, the Bolivian Capital via the Western line in combination with the international railways. Of this gross length there are at present opened to public traffic in the Argentine territory 1576 kil. 800 m., and whenever the line that is intended to connect Montevideo with Fray Bentos, a distance of 343 kilometers. is completed, and the necessary works undertaken on the banks of the Rivers Paraná and Uruguay to enable the trains to be conveyed across the water in steam-train-ferries, which has been

proved to be an easy and cheap means of locomotion, it will be possible to establish a direct railway communication to Jujuy, a distance of 1969 kilometers, linking with the port of Montevideo by a quick service the intermediate towns of Gualeguaychú, Paraná, Santa Fé, Córdoba, and Tucumán.

From Jujuy there remain 700 kilometers to be constructed in Argentine and Bolivian territory, in order that this system with Montevideo, and with the lines leaving Buenos Aires, may form a junction in Sucre or thereabouts with the Intercontinental line, over which it will be possible to continue to Oruco and La Paz in Bolivia, Puño, Cuyes and Lima in Perú, to Ecuador, Colombia, Central America, Mexico, and the United States of North America.

The express trains should be able to make the journey from Montevideo to Sucre, allowing an average speed in the two guages of 50 and 40 kilometers per hour, between Montevideo and Jujuy, and this latter point and Sucre respective by, in 57 hours.

The importance of the Montevidean port, which is the best for the ocean going steamers of any of the ports of the River Plate, will be established by means of the railway network of America, by which it will be thus able to communicate so advantageously, not only with Bolivia and Perú, but also with the Argentine Republic, Chili, Paraguay and Brasil.

Montevideo will be a centre from which rapid means of communication will be established in all directions to the interior of the South American continent.

CENTRAL AND MIDLAND URUGUAY RAILWAYS.

(Line from Montevideo to Paysandú).

EXTENSION THAT THE ROUTE WILL HAVE CROSSING THE ARGENTINE REPUBLIC AND BOLIVIA VIA JUJUY, POTOSÍ AND SUCRE TO FORM A JUNCTION WITH THE INTER CONTINENTAL LINE.

COUNTRIES.	LOCALITIES.	KILOMETRIC EXTENSION.				Gauge. Meters.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Uruguay	Montevideo to Rio Negro	273.000				1.44
Do.	Rio Negro to Paysandú	213.000				"
	Crossing River Uruguay				3.000	"
Argentine Republic.	From coast opposite Paysandú to Concepción . . .			36.000		1.44
Do.	Concepción to Paraná	286.500				
Do.	Port Paraná to Santa Fé including crossing River Paraná.				24.000	"
Do.	Santa Fé to Jujuy via Córdoba and Tucumán.	1254.300				1.00
Do.	Jujuy to Bolivian frontier				280.000	"
Bolivia.	Argentine frontier to Sucre via Potosí .				420.000	"
		2026.800		36.000	727.000	

The total distance between Montevideo and the Capital of Bolivia via Paysandú, Concepción del Uruguay, Paraná, Santa Fé, Córdoba, and Tucumán, is 2770 kilometers, of which 1542k. 800m. are opened to traffic in the Argentine Republic, and 434 kilom. in Uruguay.

The only link wanting to connect the networks of the Uruguayan and Argentine Railways is the short section of 36 kilometers between Concepción del Uruguay and the coast opposite Paysandú and this has already been surveyed, and when once constructed will establish direct communication between Montevideo and Jujuy by this route.

Once it has been arranged to cross the Rivers Uruguay and Paraná, a matter offering no difficulties, the line from Montevideo to Jujuy, via Paysandú, in a completed state ready for through traffic, will be 2062 kilometers long, and with an average speed of 50 kilometers (31 miles) per hour express trains should make the trip in 41 hours; — at an average speed between Sucre an Jujuy of 40 kilometers (25 miles) per hour, the journey from Montevideo to the Bolivian Capital should take 50 hours.

CENTRAL, MIDLAND, AND NORTH-WEST URUGUAY RAILWAYS.

(Montevideo to Santa Rosa).

EXTENSION THAT THE ROUTE WILL HAVE CROSSING THE ARGENTINE REPUBLIC AND BOLIVIA VIA JUJUY, POTOSÍ AND SUCRE TO FORM A JUNCTION WITH THE INTER-CONTINENTAL LINE.

COUNTRIES.	LOCALITIES.	KILOMETRIC EXTENSION.				Gauge. Meters.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Uruguay	Montevideo to Rio Negro	273.600				1.44
Do.	Río Negro to Paysandú and Salto. . .	317.036				"
Do.	Salto to Santa Rosa.	178.800				"
	Santa Rosa to Caseros crossing River Uruguay				3.000	"
Arg ntine Republic.	Caseros to Mercedes.	140.500				"
Do.	Mercedes to Saladas .		136.100			"
Do.	Saladas to Bajada (Corrientes) . . .	100.400				"
Do.	Bajada to Resistencia crossing River Paraná				10.000	"
Do. (Chaco) . . .	Resistencia to junction with Jujuy line above Metan. . .			634.000		"
Do.	From junction to Jujuy	161.700				1.00
	Jujuy to the Bolivian frontier				280.000	"
Bolivia.	Argentine frontier to Potosí and Sucre .				420.000	"
		1171.436	136.100	634.000	713.000	

The distance from Montevideo to Sucre, crossing the River Uruguay in front of Santa Rosa, is 2655 kilometers 536 m., of which there are open to traffic. 768k. 800m. in the Uruguayan Republic, and 402k. 636m. in the Argentine, there being 1478 kilometers to construct to establish direct communication by this route between Montevideo and Sucre, of which 645 kilometers have already been surveyed; from Resistencia to the proposed junction with the Jujuy line below Metan, crossing the Chaco (Prairie) running through most fertile camps without offering any difficulties of construction.

By the same route through Santa Rosa it is possible to communicate from Montevideo to Asunción (Paraguay), forming a junction in Caseros with to East Argentine Railway extensión running to Posadas, but this journey would be 215 kilometers longer than the Montevideo, Rivera, San Borja, Posadas and Asunción. This latter by its directness establishes the Central Uruguay Railway's prerogative as the highway to Asunción (Paraguay) as will be seen from the following tables.

Through communication between the River Plate and Paraguay.

By Central Uruguay Railway.

Extension of the through route to Asuncion, Paraguay, to form a junction with the Inter-Continental line:

COUNTRIES.	LOCALITIES.	KILOMETRIC EXTENSION.				Gauge. Metres.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Uruguay	Montevideo to Rivera.	567.000				1.44
	Rivera to San Borja.				260.000	"
Brasil Province of Rio Grande . .	San Borja to Santo Tomé crossing the River Uruguay . .				10.000	"
Argentine Republic.	Sto. Tomé to Posadas		135.000			"
	Posadas to Encarnación crossing River Paraná.				5.000	"
Paraguay. . . .	Encarnación to Pirapó		135.000			"
	Pirapó to Asuncion.	252.000				"
		819.000	290.000		275.000	

The total distance by railway that by this route will lay between Montevideo and the Capital of the Paraguayan Republic is 1384 kilometers, of which 819 kilometers are already constructed, 290 kilometers in course of construction. and 275 projected; in which latter proportion are included the crossing of the Rivers Uruguay and Paraná, that will be effected by steam train-ferries on the North American plan.

Further to the North of Asuncion the line will be continued across the Chaco (prairie) until it enters the Bolivian territory to form a junction in Sucre, or some other convenient point on the elevated lands of that Republic, with the Inter-Continental line surveyed recently by the North American Commissions of Engineers.

The completion of this system is of international importance.

In the territory of the Province of Rio Grande del Sud it will form a junction in Alegreto with the railway running from Urnguayana to Port Alegre, Bagé, Pelotas and Rio Grande; and it will also advantageously serve the western part of that Province. On the other side of the River Uruguay, by utilizing in the provinces of Corrientes and Misiones 155 kilometers of the Monte Caseros and Posadas Railway, with the exemption of crossing the River Paraná, the direct communication is already established with Asuncion by the line running from Encarnacion to that town already open to traffic for nearly the whole length.

Inasmuch as the guage of the lines constructed in Uruguay, Argentina, and Paraguay is uniform, in order to render possible direct communication between Montevideo and Asuncion, without difficulties or delays, the railway to be constructed between Rivera and Posadas in the province of Rio Grande should also be made of the same guage which will assuredly be the one that will be finally adopted for all the lines of international character and general importance.

Once the construction of the 550 kilometers of line still wanting in the Brazilian, Argentine and Faraguayan territories is completed, together with the arrangements for convenient steam train-ferries on the Rivers Uruguay and Paraná, considering the technical conditions of the Central Uruguay Railway and of those it will be possible to obtain in the railways of the other countries, express trains of the North American type of rolling stock should be able to maintain without difficulty a speed of 60 kilometers (37 1/2 miles) per hour, and in such event the journey from Montevideo to Asuncion could be performed in less than 24 hours.

At the present time by means of the best Platense Navigation Coy's boats, the "Eolo" or "Cosmos", this same journey takes five days.

The local direct traffic from Montevideo alone would thus gain four days on the actual mode of communication, and the passenger from Europe instead of requiring from 35 to 40 days for the journey to Asunción would by the land ronte only occupy 24 or 25 days.

The Argentine Republic is not in a position to serve the commerce of Paraguay by its railway system with any advantage over that which would be obtained by the Central Uruguay Railway route when the extensions may be made as far as Asuncion.

The advantages claimed by the Port of Montevideo over the Argentine ports in facilities for serving the Paraguayan commercial traffic are supported, principally, by the communication with fewer difficulties than are found in either the Ports of Buenos Aires or Concordia. To prove this assumption we will examine the various means of communication at the disposal of both ports in claiming preference for the attraction of the commercial movement of Paraguay.

In doing this we will not trouble to consider the facilities for navigation by the Rivers Plate, Paraná and Paraguay, as this means of transport will always be availed of for goods or products of small value and large volume, and such movement will equally favour both the Argentine and Uruguayan ports.

We will only dwell upon the quick railway service proposed to foster, and cultivate in a closer degree, the relations between the Paraguayan Republic and the ports of the River Plate.

The following statements will show us the actual position of the railway lines forming the links between the port of Buenos Aires or Concordia and Asuncion, also the time estimated for the through journey once the same are concluded.

BUENOS AIRES TO ASUNCIÓN, PARAGUAY.

By the railways on the left hand coast of the River Paraná.

COUNTRIES TRAVERSED.	LOCALITIES.	KILOMETRIC EXTENSION.				Gauge. Meter.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Argentine Republic.	Buenos Aires to Rosario	303.800				1676 " "
	Rosario to Irigoyen.	199.900				
	Irigoyen to Santa Fé.	76.800				
	S. Fé to Reconquista.	317.800				1.00 "
	Reconquista to Formosa		455.000			
Paraguay. . . .	Formosa to Asunción crossing the River Paraná in front of Formosa				140.000	"
		799.300	455.000		140.000	

The total distance from Buenos Aires to Asunción is 1.394 kilometers 300 meters, of which 799 kilometers 300 meters are already constructed, leaving 595 kilometers stil to be made.

As it exists the line is of the 1.676 meter gauge from Buenos Aires to Santa Fé; and 1 meter from that town to Reconquista; the extension proposed from Reconquista to Formosa will be constructed on the 1.676 meters gauge.

This change of guage will always entail a loss of time in transit through the transhipment of the wagons and will delay the transport of those goods which it is necessary to convey to their destination as rapidly as possible.

It will not make much difference to the passenger traffic but it may be supposed that once the rails reach to Asuncion, for convenience sake alone the different guages will be made uniform of 1.676 meters; the predominating gauge of the principal lines already made in this great artery as rojected.

Under such conditions the journey of 1.394 kilometers between Buenos Aires and Asunción could be made in 28 hours.

Let us now see how long it would occupy going over the Uruguayan railways.

BUENOS AIRES TO ASUNCIÓN (PARAGUAY.)

By the railways on the right hand coast of the River Uruguay.

(Via Port Concepción del U.)

COUNTRIES TRAVERSED.	LOCALITIES.	KILOMETRIC DISTANCE.				Gauge. Metre.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Argentine Republic.	Port of Concepción del Uruguay to Concordia. . . .			210.000		1.44
	Concordia to Monte Caseros	160.000				"
	Caseros to Paso de los Libres. . . .	100.000				"
	Paso de los Libres to Santo Tomé . . .		180.000			"
	Santo Tomé to Posadas		155.000			"
	Posadas to Encarnación crossing River Paraná.				5.000	"
Paraguay. . . .	Encarnación to Pirapó		135.000			"
	Pirapó to Asunción.	255.000				"
	River passage from Concepción del Uruguay to Buenos Aires	260.000				"
		775.000	470.000	210.000	5.000	

Of the 1460 kilometers which separate Buenos Aires from Asuncion by this route taking advantage of the River steamers to Concepción del Uruguay, and then travelling by the railways, 515 kilometers are already opened to traffic, the remaining 685 kilometers being either in course of construction or surveyed,

Calculating the rate of the express train service as 50 kilometers per hour, it would be possible to make the journey of 1.200 kilometers from Concepción del U. to

Asuncion in 24 hours, and as the time generally occupied between the former place and Buenos Aires is 16 hours at least, without allowing for any delay in transhipment, the journey from Buenos Aires to Asunción will take at least 40 hours by this route via the East and North East Argentine Railways through Concordia and Posadas and over the Paraguayan Railway to Villa Roca and Asuncion.

If however we should avail ourselves of the actual river service from Buenos Aires to Concordia we should then make the journey as follows.

BUENOS AIRES TO ASUNCION (PARAGUAY).

By the railways on the right hand coast of the River Uruguay.

Via Concordia port.

COUNTRIES TRAVERSED.	LOCALITIES.	KILOMETRIC DISTANCE.				Gauge. Meters.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Argentine Republic.	Concordia to Monte Caseros	160.000				1.44
	Caseros to Sto. Tomé.	100.000	180.000			"
	Sto. Tomé to Posadas		155.000			"
	Posadas to Encarnación crossing the River Paraná . .				5.000	"
Paraguay. . . .	Encarnacion to Pirapó		135.000			"
	Pirapó to Asunción	255.000				"
	River boat from Buenos Aires to Concordia	400.000				"
		915.000	470.000		5.000	

The total distance by this route from Buenos Aires to Asunción is 1.390 kilometers, including the river boat journey, and of the railway system between Concordia and Asunción there still remain 475 kilometers to be laid.

Allowing of the river journey being accomplished in 24 hours without any delay in the transhipiment to the trains, which on the express service should run at 50 kilometers per hour, the total journey from the Argentine to the Paraguayan capital should not exceed 44 hours.

BUENOS AIRES TO ASUNCIÓN.

Via Concordia, Caseros and Corrientes.

COUNTRIES TRAVERSED.	LOCALITIES.	KILOMETRIC DISTANCE.				Gauge. Metre.
		Open to traffic.	*In construction.*	*Surveyed*	*By Water.*	
Argentine Republic.	Buenos Aires to Concordia by boat . .				400.000	1.44
	Concordia to Caseros	160.000				
	Caseros to Mercedes.	140.000				
	Mercedes to Saladas.		115.000			
	Saladas to Corrientes.	100.400				
	Corrientes to Asunción by boat. . .				360.000	
		400.400	115.000		760.000	

Assuming the express trains between Concordia and Corrientes to run at an average speed of 50 kilometers per hour, the 515 kilometers would be covered in 10 $^1/_2$ hours; and as it requies at least 48 hours to accomplish the river journeys from Buenos Aires to Concordia, and from Corrientes to Asunción, allowing for the transhipment and embarkation in both ports to only occupy a very short time, with good management, the total journey by this route the passenger would require at least 65 hours.

Having this demonstrated the time required for this through journey by the Argentine route we will now sum the advantages that the Uruguayan Republic can offer by means of the Central Uruguay Railway:

ROUTE.	DISTANCE BETWEEN TERMINI.	AVERAGE EXPRESS SPEED.	DURATION OF JOURNEY.
	Kilometers.	Kilometers.	Hours.
Montevideo to Asunción via Rivera, San Borja, Posadas, Villa Rica and Asunción	1387	50	28
Buenos Aires to Asunción:			
(a.) Via Rosario (Santa Fé), Reconquista, Formosa and Asunción	1394	45	31
(b.) Via Concepción del Uruguay, Concordia, Caseros, Santo Tomé, Posadas, Villa Rica and Asunción	1460	50	40
(c.) Via Concordia, etc.	1390	"	44
(d.) Via Concordia, Caseros and Corrientes, etc., etc	1276	"	65

By this statement we see at a glance the distance and time occupied by the various routes of communication between the River Plate ports and Asunción, and we would point out that the route through Uruguay and Río Grande starting from Montevideo offers much greater advantages over the Argentine lines for the following reasons:

(1) The means of communication with Montevideo afford a direct service without change of grade (1.44m.) whereas the route via Rosario by railway from Buenos Aires, owing to the difference in gauge, and by the other mixed land and water transit require several transhipments with a consequent loss of time varying from 31 to 65 hours.

(2) The frequent transhipment of goods in transit would tend to facilitate smuggling to prevent which the Revenue Officers would to exercise extra vigilance which would not occur on the transport direct from the port of Montevideo to Paraguay territory without any transhipment or change wagon.

(3) Another great disadvantage of the mixed routes would be the extra cost of the merchandise which would be incurred through the losses sustained in breakages etc. by transhipment from one means of transport to another.

(4) The only route which by establishing a uniform

gauge would enable the Argentine to compete with the line from Montevideo would be the line vía Santa Fe and Reconquista.

We should also remark that the route from Montevideo to Asunción is shorter and more advanced than the one from Buenos Aires as whereas the latter has only 799 kilometers opened to traffic the former has 822.

Communication between Montevideo and Rio Grande del Sud.

Extensión that the route will have in the Province of Rio Grande to form a direct line between Montevideo and Port Alegre.

Vía North Eastern Uruguay Railway.

COUNTRIES TRAVERSED.	LOCALITIES.	KILOMETRIC DISTANCE.				Gauge. Meter.
		Open to traffic.	*In construction.*	*Surveyed*	*Projected*	
Uruguay	Montevideo to Nico Pérez	229.488				1.44
	Nico Pérez to Melo				200.000	"
	Melo to Artigas . .				105.000	"
	Artigas to Yaguarón.				1.000	"
Rio Grande del Sud	Yaguarón to Piratini.				80.000	"
	Piratini to Pelotas .	80.000				1.00
	Pelotas to San Lorenzo, colonies and Camaquam . . .	44.000	97.500			"
	Camaquam to San Gerónimo.			189.000		"
	San Gerónimo to Port Alegre by boat on the River Jacuhy .	50.000				"
		403.488	97.500	189.000	386.000	

Allowing for the difference in gauge between the Brazilian and Oriental railways in calculating the speed of the trains at 40 kilometers per hour the journey from Montevideo to Port Alegre vía Pelotas should not occupy more than 27 hours.

EXTENSION THAT THE ROUTE WOULD HAVE CROSSING THE PROVINCE OF RIO GRANDE DEL SUD TO COMMUNICATE WITH PELOTAS, RIO GRANDE AND PORE ALEGRE BY MEANS OF BOAT VÍA LAKES MERIN AND DE LOS PATOS.

Via Uruguayan Great Eastern Railway.

COUNTRIES TRAVERSED.	LOCALITIES.	KILOMETRIC DISTANCE.				Gauge. Meters.
		Open to traffic.	*In construction.*	*Surveyed*	*Navigated*	
Uruguay	Montevideo to Solis Chico	70.000				1.44
	Solis Chico to Maldonado		83.463			"
	Maldonado to Port Cebollati on Lake Merin			306.000		"
Rio Grande del Sud	Port Cebollati to Pelotas				220.000	"
	Do. do. to Rio Grande				265.000	"
	Do. do. to Port Alegre				495.000	"
		70.000	83.463	306.000	495.000	

Taking advantage of the navigation of lake Merín the distance separating Montevideo, from Pelotas would be 679 kilometers; from Río Grande 724 kilometers, or from Port Alegre 954 kilometers;—and with express trains travelling 40 kilometers per hour, and steamers sailing 10 miles per hour, these journeys could be made in 25 or 26 hours to Pelotas; 29 or 30 hours to Río Grande; and 42 to 45 hours to Port Alegre, the service of course being organized to avoid delays in calling at intermediate ports.

Generally, and especially in times of busy traffic, the delay to steamers in port to load and unload cargo is a matter of some time, and although it is true there is some delay in picking up roadside traffic on the railway still it is only a question of minutes to shunt the wagons off or on, and thus with a shorter distance to travel by

the mixed route from Montevideo to Port Alegre than by the railway, the latter journey will always occupy less time on account of the more rapid means of communication.

The communication between the port of Montevideo and the Eastern region of Rio Grande as far as Port Alegre may thus be made by two land routes as indicated over the North Eastern and Great Eastern of Uruguay Railways.

We have dwelt upon the distances and length of journey that the Uruguayan railways which run in the direction, of the River Uruguay, separating us from the Argentine Republic, and of the frontier of the neighbouring province of Rio Grande del Sud would develop, and we will now pass on to examine the connexions that the Interier Uruguay Railway would have with the general railway system connecting with Montevideo as also the development it would experience outside the boundaries of the Uruguyan Republic.

INTERIOR OF URUGUAY RAILWAY.

By the law published on the 6th of September 1889 the construction of this line was authorized, the Nation guaranteeing 6 % interest on a cost of £ 5.000 per kilometer. The concessionaires have already submitted to the Government the final surveys of the whole line which is 617^{622} kilm. long.

This line starts from the town of Colonia, facing the cities of Buenos Aires and La Plata, and runs through the heart of the country as for as San Luis on the Brazilian frontier: crossing as it does the Western, Central and North Eastern Railways, it provides inter-communication between these important lines which otherwise have no connecting

point except their starting place-Montevideo: it will serve rich and populated districts, and by reason of its junctions with the three principal lines, it will be able to interchange with them traffic to and from all parts of the country.

The direct line from Colonia to San Luis is 582^{891} kilometers long. At kilometer 89 it will form a junction with the Western line which runs from Montevideo to Mercedes and Fray Bentos and communicates by the Argentine lines with Bolivia where it will join the Intercontinental Railway. At kilometer 211 it will join the Central Uruguay Railway which, also starting from Montevideo, runs to Rivera, to be prolonged as far as Asuncion (Paraguay) through Brazilian and Argentine territory, this junction will afford the Interior of Uruguay Railway communication with Paysandú, Salto, Santa Rosa and San Eugenio. From kilometer 338 a branch 36.731 kilometers in length will run to Cerro Chato. where it will form a junction with the North Eastern of Uruguay Railway, should the extension of the latter from Nico Perez to Artigas pass through Cerro Chato; if on the other hand the direct route to Melo and Artigas be chosen, the above-mentioned branch to Cerro Chato will be prolonged to Nico Perez where the junction with the North Eastern line will be made.

By means of this junction, the Interior of Uruguay Railway will communicate with Montevideo, the Eastern and North Eastern districts of the Republic and also with the cities of Rio Grande, Pelotas and Porto Alegre, with which the North Eastern line will, by the railways of that part of Brazil, will be in communication.

As this line forms port of the Inter-Oceanic Railway from Recife to Valparaiso, we will speak of its development outside the frontiers of the Republic when considering the

importance of the latter line, a point we will discuss in a separate chapter.

With the Interior of Uruguay Railway and the port of Colonia (its starting place) traffic from Buenos Aires and the greater part of the Argentine provinces which may require to go to to the interior of the United States of Brazil, will make use of the said port, which with the aid of line and its extension to Recife, will supply the necessities ef communication between the Plate and interior Brazilian States.

Once the line from Montevideo to Maldonado is finished and the necesary improvements effected in the port of the latter place, so that ocean vessels may work there, any traffic that may require rapid transit to Montevideo, the Argentine, Chili, Rio Grande, Paraguay, Bolivia, Perú, etc. would take land route at that port.

Our three natural ports, by reason of their depths which alllow vessels drawing 20 to 23 feet to perform the operations of loading and discharging, will play a most important port in the rapid South American communications. With increased traffic and commercial activity, improvements can be projected and carried out in the ports of Maldonado Colonia, which are capable of being made the best ports this part of America.

The ports of Montevideo and Maldonado, with the aid of the net-work of South American railways, are destined to form part of the system of rapid communication between Europe and Great Britain and the irland States of Southern America and the Pacific; and all traffic proceeding from these places, as also from the States of Pernambuco, Bahia, Minas Geraes, San Paulo, Paraná, Santa Catalina and Rio Grande del Sud to the Argentine and Chilian Republics and viceversa, can be carried through the port of Colonia,

in its turn, and as the Inter-Oceanic line will shorten the time necessary for communication between New Zealand and Australia and the European continent via Lisbon, the port of Colonia will, in the future, receive traffic from even those for distant regions.

And let it not be said that this is a beautiful but unrealizable dream, rapid communications all over the world are and will be realized by means of the iron road.

In the journey between the Pacific and the European continent, in the future, the sea-voyage will be reduced to the lowest minimum possible, and the route will be as follows: by railway from Valparaiso to Recife, by steamer from Recife to Dakar and by railway from Dakar to Gibraltar, where entrance is obtained to the European network of railways by which any desired point can be reached.

This, roughly, will be the route to be followed, in the future, for rapid communication between Australia, New Zealand, the Pacific, the Plate and the European Continent.

It will be objected that when the Panamá Canal is opened, the Plate will lose much of its importance as a means of communication with Australia and the Pacific, but if it be remembered that the distance between Australia and Europe, whether by Panamá or by Valparaiso and Recife, it will be agreed that for rapid communicaciones, the Plate route will always have the preference.

In conclusion: passenger and postal traffic from abroad proceeding to Buenos Aires via the port of Maldonado and the Railway to Colonia, a distance of 260 kilometers, would arrive in Buenos Aires in 8 hours, the express passenger train, at the rate of 50 kilometers an hour, taking six hours, and the passage from Colonia to Buenos Aires, two effecting a saving of 16 hours in the time occupied by the

Transatlantic steamers, supposing that from Maldonado to Montevideo they take 4 hours, are 12 hours in the latter port loading and unloading and take 8 more crossing to Buenos Aires: the passengers and correspondence for the Pacific, Bolivia or Perú would also save these 16 hours, supposing that passengers for these places and for Chile should require to pass through Buenos Aires; but making use of the direct lines which radiate from Montevideo towards the Argentine Republic, Bolivia and Perú, the economy in the time for communication between the ports of Montevideo or Maldonado and Entre Ríos, Santa Fé, Córdoba, Tucumán,. Jujuy, Bolivia, Perú, etc. would be at leost 24 hours, which, considering the demands of rapid transit, would be very appreciable.

General conclusions.

CHAPTER XII.

GENERAL CONCLUSIONES.

We are now approaching the conclusion of this work. In the foregoing chapters we have detailed the elements which form the railway system of each of the South American countries and the route followed by each line, and have also shown how they could be united so as to establish intercommunication between the South American States.

The following statements show the total railway development of the American Continent, and that of each State compared with the others, as regards area, population, commerce, and capital invested in the lines.

TOTAL LENGTH OF THE RAILWAYS.

STATES.	DATE.	LENGTH OPEN TO TRAFFIC.
United States of North America.	1st of January 1892	km. 275.270
Dominion of Canada.	" " "	" 22.553
Argentine Republic.	" " 1893	" 12.994
Mexico.	September 1892	" 10.660
Brazil	1st of January 1892	" 10.281
Chili	in 1891	" 2.824
Uruguay	1st of January 1893	" 1.602
Perú	" " "	" 1.532
Bolivia.	" " "	" 923
Venezuela.	" " 1892	" 480
Colombia	" " "	" 320
Costa Rica	" " "	" 259
Paraguay	" " 1893	" 252
Nicaragua.	" " 1892	" 145
Honduras	" " "	" 111
Ecuador	" " "	" 92
Salvador	" " "	" 90
Total		km. 340.388

The American Continent possesses as many railways as those of the world put together, their united length at January 1st. 1892 being 348.876 kilometers. To join together all these great arteries is the object of the two great projected lines, the incontinental and the interoceanic, which are treated upon in Chapters VIII and IX.

We are fully aware that in order to facilitate the realization of this idea and procure that these two international arteries fully carry out the purpose for which they are intended, it will be necessary to establish a *technical unity* for their material and rolling stock, a question of the most vital importance, which should be discussed and resolved at an International American Conference.

For South America the question is one of real importance its respective systems have not attained the development for which they are destined, and the lines which may be classed as international do not always preserve the conditions of technical uniformity that they should; singly, they will serve well the local or general traffic of each State, but the same will not happen when an endeavour is made to join them for international traffic.

For this reason, the realization of the two great projects, the international and interoceanic lines which are intended to provide inter-communication for the railway systems of the various States composing the Continent, cannot perhaps be carried out, without previously inviting these States to an International Railway Conference, which could be held at Washington or in one of the Plate Republics, and at which a solution of the capital points of the uniformity of tracks and rolling stock, the junctions and their service, forms of compensation, freedom of terrestrial passage etc, could be arrived at, many of which points were sketched out at the Pan-American Congress of Washington.

All these questions are of the highest importance, and demand a solution based on the precepts of science, experience and the art of construction.

With respect to the importance for the American States of uniform general principles in this matter, we recollect that at the present moment there is before the Public Powers of Bolivia a railway project, the object of which is to unite the city of Potosí and Laquiaca, (on the Bolivian Argentine frontier) the terminal point of the Argentine Central Northern Railway. This project is fostered by the distinguished Bolivian citizen doctor Antonio Quijarro, and has already been favorably reported on by the engineering departments of that country.

Will the type of track that may be adopted for this railway, which is intended to place Bolivia in communication with the Plate, harmonize with that used in the intercontinental line and its branches to Buenos Aires, Asunción (Paraguay), Montevideo and Río de la Plata?

The mere formulation of this query shows that no real advance can be made in the practical solution of the question, without the concurrence of the parties interested, unless the American States define and establish the conditions which will allow of free transit over all the first-class railways of the Continent.

Having concluded this digression, we will now continue our synthetical observations on the South American Railway, showing their relative length per 1000 square kilometers.

LENGTH PER 1.000 SQUARE KILOMETERS.

United States of North America . .	29	kms.	137	mts.
URUGUAY.	8	"	964	"
México	5	"	190	"
Costa-Rica	4	"	981	"

Salvador.	4	kms.	812	mts.
Argentina	4	"	483	"
Chili.	3	"	676	"
Canadá	2	"	743	"
Perú.	1	"	435	"
Brazil	1	"	233	"
Nicaragua	1	"	082	"
Paraguay	0	"	997	"
Honduras	0	"	914	"
Bolivia	0	"	756	"
Venezuela	0	"	312	"
Colombia	0	"	240	"
Ecuador	0	"	139	"

The railway communication per 1000 square kilometers possessed by the Uruguayan Republic is a third of that of the United States of North Americ; almost double that of Mexico, Costa Rica, San Salvador, and Argentina; two and a half times as great as that of Chile, seven and a half times that of Perú Brazil and Nicaragua; between eight and nine times that of Paraguay, Honduras and Bolivia, and about 35 times more than that of Venezuela Columbia and Ecuador, which shows that the relative railway development of our country is greater than that of all the other American States, excepting the United States of North America.

We will now give the length of the railways in comparison with the population:

LENGTH PER 1.000 INHABITANTS.

Canadá	4	kms.	510	mts.
United States of North America	4	"	066	"
Argentina	2	"	961	"
Uruguay	2	"	063	"
Costa Rica	1	"	169	"
Chili	0	"	855	"
México	0	"	828	"
Brazil	0	"	693	"
Paraguay	0	"	693	"
Bolivia	0	"	461	"
Perú	0	"	418	"
Nicaragua	0	"	365	"
Honduras	0	"	247	"
Venezuela	0	"	203	"
Salvador	0	"	128	"
Colombia	0	"	085	"
Ecuador	0	"	079	"

Uruguay has nine-twentieths as much railway communication, compared with population, as Canadá, which is the country with the largest ratio of railways to inhabitants; half that possessed by the United States: seven. tenths of that of the Argentine; almost double that of Costa Rica; two and a half times that of Chili and México; three times that of Brazil and Paraguay; about four and a half times that of Bolivia, Perù, and Nicaragua. rive times that of Honduras and Venezuela, and about twenty times more than Salvador, Columbia and Ecuador.

Uruguay, therefore, ranks fourth among the American countries that have done most to provide their inhabitants with railway communication.

The following statement shows the relative importance

of the commerce of each of the States possessig a greater length of constructed railways:

STATES.	Years.	Kilóm. open to traffic.	Imports and exports.	Value of imports and exports per kilometer of railway.
Chili	1891	2.824	$ 116.628.186	$ 41.298
URUGUAY . . .	" (1)	1.602	56.092.356	35.014
Brazil	1890	9.800	262.766.160	26.813
Argentine Republic .	1891	12.134	182.794.313	15.060
Perú.	"	1.532	22.050.898	14 390
México	"	10.150	119.467.719	11.770
United States of North America. . . .	"	275.270	1.717.186.000	6.238
Canadá	"	22 553	44.919.000	1.940

This statement shows that the import and export trade of Uruguay, per kilometer of railway, compared with that of the countries possessing most railways, is almost six times that of the United States of North America; 18 times that of Canadá and three times that of Mexico; two and a half times that of Perú; one and a third times that of Brazil, and seven-tenths of that of Chili; so that even from this point of view, the railway development of Uruguay is encouraging, as it occupies the second place on the list.

But where the commercial power of Uruguay is most evident, and which is a most important factor for judging the present and future vitality of its railways, is in the value which each inhabitant contributes to the formation of commerce with abroad in the shape of imports and exports:

The following statement will give this factor for all the countries of the American continent:

(1) The value of the imports and exports is the average for the five years from 1887 to 1891.

STATES.	Population 1891.	Imports.	Exports.	Comerce per inhabitant.
URUGUAY. . . .	750.638	$29.453.572	$26.649.805	$74.87
Costa Rica	262.400	8.351.029	9.664.607	68.66
Argentine Republic.	4.326.155	119.602.856	98.685.256	50.45
Dominion of Canadá.	4.829.411	113.345.000	88.801.000	41.65
Chili.	3.200.000	61.982.729	62.441.330	38.89
United States. . .	64.500.000	844.916.000	872.270.000	26.62
Nicaragua	298.968	2.780.000	3.500.000	21.00
Brazil	14.568.120	119.745.160	143.021.000	18.50
Ecuador	1.332.000	10.861.553	8.822.160	15.15
Paraguay	350.000	2.962.666	2.574.333	15.82
Venezuela	2.323.527	14.722.882	20 183.467	14.90
Salvador	777.895	2.401.000	7.579.000	12.82
México.	11.885.607	44.000.000	75.467.715	10.05
Colombia.	4.000.000	13.241.438	19.829.751	8.27
Perú.	3.980.000	14 172.712	12.354.536	6 66
Bolivia.	2.442.841	3.569.280	7.650.240	4.59

Taking the commercial power of Uruguay according to the foregoing statement, as $ 74.87 per inhabitant, it results that in the other countries the following population would be required to equal our import and export commerce.

URUGUAY	750.638	inhabitants.
Costa Rica	854.986	"
Argentine Republic	1.112.059	"
Dominion of Canadá.	1.347.072	"
Chili	1.442.617	"
United States of North America .	2.155.740	"
Nicaragua	2.672.066	"
Brazil.	3.032.615	"
Ecuador	3.703.193	"
Paraguay.	3.546.358	"
Venezuela	3.765.327	"
Salvador	4.376.239	"
México	5.582.426	"
Colombia.	6.783 964	"
Perú	8.423.930	"
Bolivia	12.222.959	"

This superiority on the port of Uruguay over the other

American countries with respect to its commerce, is explained by the London "Economist" of October 17 th 1891 in an article entitled "Relative debts and assets of the South American States", in the following manner:

" In Bolivia, Perú, Colombia and Paraguay the indians " and halfbreeds predominate, and in Brazil and Venezuela " indians and negroes, and their mixtures with the whites " and between themselves, for which reason it should be " borne in mind that populations composed of such inferior " races, especially as regards their financial capacities, are " less capable of supporting public debts.

" So that by the figures shown Uruguay may be given " the first place on the list with an income of L 4 — and " export of L 7 — per head, and we are not far wrong " in saying that this Republic could easily support a debt " which would be oppressive to Perú.

"Chili and the Argentine Republic would occupy the " second and third places respectively on the scale.

" There are cases in which the income and export do " not even amount to L 1 per head, which may be explained " by the predominance in the population of inferior races.

" It may therefore be argued, that the South American " countries that are most capable of resisting the pressure " of a heavy public debt *per head* are: Uruguay, Chili and " Argentina, in the order in which they are given, the " next, although much behind, being Brazil. "

We will now indicate the capital represented by the South American Railways.

CAPITAL REPRESENTED BY SOUTH AMERICAN RAILWAYS.

STATES.	Years	Kilometers open to traffic.	Principal gauge.	Average price per kilometer.	Cost in dollars.
Argentine Republic.	1892	12.993 k. 500	1m676	30.629	397.684.593
United S. of Brazil .	1891	10.280 " 420	1m	29.726	305.596.190
Chili	1891	2.823 " 600	1m60	46.010	129.915.009 (1)
URUGUAY . . .	1892	1.601 " 840	1m44	30.599	49.013.908
Paraguay	1892	252 " 000	1m44	30.000	7.560.000 (2)
Bolivia	1892	923 " 000	1m75	—	—
Perú	1892	1 531 " 425	1m44	100.000	153.142.500 (3)

According to this statement, Perú is the country which has paid most dearly for its railways; this is explained by the extremely broken nature of its soil which has necessitated exceptional works of art in most of the lines which run across the Andes, in order to join the interior of the country with the Pacific ports.

Then follows Chili where, although we are not sure of the exact figure per kilometer in view of the difficulties which have had to be overcome, the cost must have been high; then come Argentine Republic, Uruguay and Paraguay with a more or less equal average cost, and lastly Brazil. with a cost per kilometer almost equal to the las three states named.

It may appear anomalons that Brazil should have expended on its system a relatively less cost than that employed by

(1) The cost of the 1106 kilometers of railway belonging to the Nation in the year 1890 was $ 56.453.511 Chilian gold, and taking the average of this as a base for calculating the cost of the 1652 kilometers of private lines, we find that the cost of the Chilian railways, including the 55.600 kilometers constructed and handed over in 1891, will be more or less $ 129.915.009.

(2) The price of $ 30.000 gold per kilometer is that fixed in the contract of concession of the line to Villa Encarnación.

(3) Mr. Bresson, the engineer, his work "Bolivia" published in 1886 estimates that the average cost of the Peruvian Railways is 500.000 francs per kilometer.

Argentine and Uruguay, as its railway system runs across mountainous districts; but this is partly explained by the fact of the narrow gauge predominating in Brazil on account of the nature of the soil, while in the Argentine Republic the broad gauge is prevalent, and in Uruguay the 1 meter 44 gauge is the only one used; — but, of all the South-American countries, we consider that it is Brazil that has built its railways cheapest, if it be borne in mind that in carrying them out difficulties have had to be overcome which were not met in the Plate Republics.

We will now conclude by showing the burden, in the shape of guarantees to the railways, borne by the produce to whose development they contribute.

We will detail this amount proportionally comparing the distribution of the guarantee between the River Plate Republics and Brazil for each $ 10.000 of exports:—

COUNTRIES.	*Opened to service guaranteed length.*	*Capital guaranteed.*	*Interest %*	*Amount of the guarantee service payments*	*Population.*
		$		$	
Brazil . . .	5649 km.	192.013.826	6 & 7	12.480.898	873
.Argentine Rep.	3696 "	80.617 611	5, 6 & 7	4.806 105	488
Uruguay. .	1175 "	27.505.989	3 1/2	962.709	331

From these recapitulatory statements it is seen, in addition to the remarks already made, that the United States of North America is the country heading the list in this continent of those nations noted for railway enterprise.

What is the principal cause of this supremacy? We do not hesitate to reply that, in addition to the natural riches and productive power of that great nation, the secret of its enviable railway progress is found in the economie technical

form adopted by the Americans for the construction of their railways.

The Americans have adapted the railroads to the exigencies of the New World, with various modifications in the European technical programmes, by which they have achieved a veritable conquest in the arrangement of rapid and economical transport.

As is well known, to be perfect a railway should have very easy gradients and curves of large radius, but it unfortunately happens that the object of economy in the cost of traction is generally the one causing most outlay in the cost of constructing the line.

In France, for example, when constructing the first great railway lines which were intended to run through the most important cities and to supply a very quick service, the engineers considered it necessary and indispensable to allow only very easy gradients and curves with large radii, in order, so they said, not to require of the engines of the fast trains special extra tractive power or any notable decrease of velocity.

The technical programme they adopted only allowed of gradients varying from 0.05 to 0.10 meters per meter; and curves with a minimum radius of 800 meters; under these conditions the first and principal lines of the French general railway system were constructed without any consideration of expense with the view of obtaining an economical working result.

At first sight one might think that the programme adopted there and attended with good results, should be the one applicable for railways of general interest in this part of America, but the economic and natural conditions of the two continents are entirely distinct.

The construction of the railways there has been carried

out with an already densely populated district, and with established commerce and industries; on this side they have been made with a view to populating immense plains, and to create the industries suited to the districts they have to cross.

Thus taking as an example for comparison, let us say, France, the resources at command for the construction of the great trunk lines were immunerable; capital was plentiful, waiting to be employed in safe investments at a moderate rate of interest and under such favourable conditions the necessary capital for the construction of the lines was easily obtained. Here, on the other hand the capital invested in the construction of railways has been bronght from abroad, attracted by high guarantees authorized by the States and by the immunerable concessions granted to the companies; in short, the European lines were built to supply a traffic already existing, whereas those of America were to create a traffic and to populate deserts, — and under such disparity of conditions it has not been possible even in lines of first importance to follow the severe programme we have mentioned of the French lines, which although it is true renders the working easier, also increases very much the amount of capital required for the construction.

On this account the Americans when constructing their great lines laid them down in the most economical manner possible. They required to facilitate communication over an immense tract of territory and so that their railways might be a real factor in the opening up of their natural riches; even in the most distant States of the Union it was imperative that their construction should not demand excessive capital so that great distances of line might be laid to establish communication between all the great capitals.

The technical programme they adopted for the longitudinal section of their lines of primary importance was the following: in slightly rugged districts, gradients of 10 and 15 °/₀₀, rising to 20 °/₀₀ in some portions of the lines; the minimum radius of the curves being 400 meters, and in special cases 300 meters. In the mountainous regions the gradients varied from 20 to 30 °/₀₀ and the radius of the curves at times was only 200 meters (Lavoime & Poityen.— "Les Chemins de Fer en Amérique").

It should also be remarked that these programmes have also not been definitely executed to perfection at the time of first installation, costly construction works being more often than not provisionally supplied by temporary structures.

When a mountain range crossed the direction taken by the line, the excessive cost of tunnelling through same was avoided by studying some other means of reaching the desired goal, and if crossing its summit was found less costly than going through the mountain, the line was thus carried over, the work finished and the railway opened to traffic without loss of time.

When a river impeded the extension of the railway by the enormous expense the crossing of same would have required for a bridge, this was met by transporting the trains over on steam train rafts or ferries, a system perfected in the United States.

Furthermore in order that the technical programme that we have indicated should be really practicable, it was necessary to give the rolling stock a flexibility of motion to render possible the construction of curves of such small radius in the mountainous districts traversed. The bogie truck invented by Mr. John Jervis has been the great element for this object. It has allowed a notable increase in the weight of the engine without the necessity to

proportionally increase the weight of the permanent way materials, thus allowing the running of heavy and fast trains on light and unfinished roads, and their working in equal economical conditions to the European lines that have been constructed at such a high cost.

The plan of gradual improvement of the general construction as the traffic increases, replacing the provisional works by definite ones, that has been observed in the United States with great success, should be also followed in the South American Countries if we want the railways to be with us, as they are there, a powerful element in the opening up of the natural riches and of international relationships.

Even in the great trunk lines of the first importances, that will serve as connecting links for the 340.000 kilometers of railway lines existing in the Continent, if the resources at command at the time of construction do not allow in certain regions of permanent works, these should be supplied by provisional structures, according to the special circumstances of the case, in the same manner that the North American engineers have overcome such obstacles to hasten the opening of the lines to traffic.

Let us imitate our brothers in the North and not be discouraged because difficulties have to be overcome in the building up of our national greatnsss and in establishing true bonds of union and fellowship amongst the nations of America! Let us bear in mind that large schemes only alarm those small minds who see insuperable difficulties wherever they may turn!

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Causes of the railway development of the United States of North America — its natural riches and the economy observed in constructing its railways; convenience in adopting the technical programmes followed by the North Americans for the construction and working of the South American Railways. 584

PRINCIPAL ERRATA.

1. Page 48, 1.st line of the note, for *wood* read *woods*.
2. Page 61, line 7, for *the earnings of same* read *by their earnings*
3. Page 113, line 29, for *114* read *1.140*
4. Page 115, line 7, for *is* read *are*.
5. Page 152, line 27, for *Colon* read *Tucumán*.
6. Page 416, line 8, for *Northern of the United States* read *United States of North America*.
7. Page 423, line 8, for *Cuaca* read *Cauca*.
" " " line 14, for *Papaya* read *Popayán*.
8. Page 468, line 23, for *the furnished for is* read *furnished and for his*.
9. Page 474, line 33, for *feet* read *feed*.
10. Page 477, line 24, for *thereout* read *the route*.
11. Page 527, line 24, for *the the* read *which the*.
12. Page 565, line 5, for *is shorter and* read *besides being shorter, is*.
13. Page 570, line 24, for *Recife, it* read *Recife, is more or less equal, it*.
14. Page 575, line 2, for *General conclusiones* read *General conclusions*.

PLATES.

TYPES OF THE BUILDINGS AND CONSTRUCTIONS OF THE URUGUAYAN RAILWAYS.

(On the 128th. and following pages.)

N.º 1. Cross section of the road (average types).

N.os 2 and 3. 2nd. and 3rd. class stations.

N.º 4. Culverts of 2 meters span.

N.os 5, 6, and 7. Bridges of 5, 10, and 15 meters span.

N.os 8, 9, and 10, and figures N.os 1 and 2 of plate N.º 12: Bridge over the river Santa Lucia.

N.º 11, and figures N.os 3 and 4 of plate N.º 12: cross sections longitudinal section, and elevation of the tunnel on the line to Rivera.

N.os 13 and 14. Bridge over the river Rio Negro.

NOTE. — The scale on plate N.º 4 is 1 in 100 instead of 1 in 200. The scale indicated as relating to figures N.os 3 and 4 of plate N.º 12 should be struck on.

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